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ANTHROPOLOGY.—*Archeological accomplishments during the past decade in the United States.*[1]

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During the past 12 years archeological exploration in the United States has been accelerated to such a degree that many felt the profession scarcely prepared to profit by all the advantages placed at its disposal. Never before, and perhaps never again, will so many archeological sites be excavated simultaneously within the continental United States. The archeologists who participated can congratulate themselves in having accomplished so much under such unusual stimulation.

Prior to 1930 average field expeditions consisted for the most part of 10–15 laborers and assistants, working continuously from 3 to 4 months, with an average cost of about $2,500. From 1935 to 1940 exploration personnel increased to an average of 150 men and functioned from 36 to 48 months continuously. Well-staffed laboratories were established in the field. The material culture obtained was cleaned, prepared, classified, restored, and processed from day to day. The technique in some instances was streamlined to such an extent that almost from the time the first shovel was pushed into a site archeological specimens and data began to roll out in published form. An archeologist could no longer ponder or gloat over the results of a back-breaking day of digging. He had to serve as engineer and personnel manager handling large crews of men; as an efficiency expert, and above all, a skilled public accountant, timekeeper, and high class executive. At night reports of the day's work were written. Everything as far as possible had to be standardized. Above all, many thousands of men and women were given legitimate employment. Total man-hours on large-scale projects reached astronomical proportions. The final results may never be entirely comprehended; mistakes were made, but the contributions to American archeology have been enormous. One can safely assume that if a goal had been set in 1930 under the prevailing conditions of the time, for archeological explorations within the subsequent 50 years, this goal has already been reached and in some areas surpassed during the past 6 or 7 years.

Many factors have played an important part in bringing about the results during the past decade. One of the most important was the Federal financing of archeological projects to provide legitimate employment for thousands of laborers in the field and laboratories. Prior to 1930 Federal assistance to States was limited to a "Fund for Cooperative Ethnological and Archeological Investigations," supervised by the Bureau of American Ethnology under the Smithsonian Institution, to which competent scientific organizations with limited funds could apply.

Early in 1933 various States obtained funds from the Federal Government, through the Emergency Relief Administration, to assist in giving employment to their needy. Under such a grant the town of Marksville, La., provided me with a number of laborers for the excavation and restoration of the Marksville site. Because I was unaccustomed to providing gainful

[1] Address of the retiring president of the Anthropological Society of Washington, delivered at the 707th meeting of the Society, April 21, 1942. Published by permission of the Secretary of the Smithsonian Institution. Received April 23, 1942.

employment to more than 10 men working on a mound, it required considerable experimentation and readjustment to keep a crew of over 100 men busy and yet provide careful supervision while excavations progressed on three mounds, a village site, and a man-made earth embankment partially encircling the site. This experience, however, proved valuable when in December 1933 the Civil Works Administration was established in Washington. Its primary purpose was to reduce unemployment. Previous experience at Marksville had convinced the Smithsonian officials that under proper supervision and with a sufficient number of trained men, worth-while scientific results on a large scale could be obtained. Within a few weeks 11 archeological projects employing about 1,500 persons were organized. The sites selected were limited by climatic and economic factors. Seven projects were established in Florida, and one each in Georgia, North Carolina, Tennessee, and California. The selection took into consideration a long range program of archeological research, especially in areas where it would not interfere with existing programs of state or other outside organizations. Those who played an active part in this emergency may recall the many headaches and uncertainties resulting from the experiment. Nevertheless it proved that under competent and trained supervisors, scientific archeological explorations could serve as a legitimate channel for relief employment. The publications resulting from these relief explorations, which lasted from about the middle of December 1933 to April 1934, indicate that scientific standards were maintained. Many of the unforeseen difficulties which resulted from this rapidly organized program were later corrected.

About the same period a new type of emergency presented itself along the Tennessee River and its tributaries, namely, the eventual flooding of vast areas as a result of the construction of several Tennessee Valley Authority dams. Realizing that numerous archeological sites were located in the areas to be flooded, and that the impounded waters would either destroy or prevent any excavation of these sites, the board of directors of the T.V.A. appointed Maj. W. S. Webb to supervise the necessary surveys and excavations in southern Tennessee and northern Alabama. Here again the required labor was furnished by C.W.A., F.E.R.A., and W.P.A. relief agencies.

In some respects the success achieved by the archeological projects under the direction of the Smithsonian Institution caused numerous archeologists to apply for similar projects within their States. Because of the limited archeological staff in the Smithsonian Institution it was impossible actively to direct the many projects submitted to the new organization, known as the Works Progress Administration. The Smithsonian Institution was requested, however, to assist the Federal W.P.A. office in an advisory capacity in determining the qualifications of the men assigned by the state to direct the archeological programs outlined in the various applications. Within the following year one-half of the States in the Union made application for archeological projects. As time went on these programs became better organized until in July 1938 only state-wide projects under direction of the most competent organization, museum, or university within the State were considered eligible. From then on the responsibility of a program of excavation, laboratory analysis, and the writing and publishing of the final report rested entirely in the hands of the state archeologist and the sponsoring agency.

Quarterly progress reports resulted from all these projects and these reports were recently deposited in the National Museum.[2] These are now indexed and a brief summary made of the work reported. In many cases the sponsoring agency has published a detailed report of excavations and summarized the results obtained; in other

[2] The following restrictions have been placed on the use of these quarterly reports: "Although these reports are available to qualified and interested persons, care must be taken that no publication should result from the use of these materials except (A) after the scientific sponsor has been notified and has granted permission; (B) after the scientific sponsor is unable to publish a detailed report; (C) after the scientific sponsor has published a full account of the results obtained."

cases the final reports are awaiting publication. Several progress reports have been published from time to time.

At the end of this fiscal year, June 30, 1942, almost all archeological exploration sponsored by the Works Progress administration and those assisted by C.C.C. allotments will terminate. Some of the laboratories processing archeological specimens may continue to operate on a reduced staff basis until all specimens have been analyzed. It is, therefore, within the period covered by this paper that the origin and completion of one of the most far-flung archeological enterprises ever undertaken by a single nation were accomplished.

To compare the results dollar for dollar would be impossible. The money allotted by the Government was matched by the sponsor in varying degrees ranging from 5 per cent to as high as 50 per cent of the total spent, but the main purpose was to provide legitimate employment to the thousands of relief workers. In most cases over 85 per cent of the total allotments were used for wages or salaries, because the overhead expenses of archeological supplies, such as shovels, trowels, and laboratory material cost relatively little. Since the results obtained were entirely scientific and educational, no overproduction resulted. The most immediate danger, if these projects were to have continued for another 10 years, would have been exhausting all archeological sites. After such large-scale operations, working under the pressure of time, it may be fortunate that this phase of field work will now be terminated. After the results have been digested and summary reports published, it will give the archeologist an opportunity to survey critically the new contributions that have been made and plan future research work, even with a reduced crew, toward the solution of certain important problems on the basis of the many new theories resulting from the work of the past ten years. Then, too, if our techniques, laboratory analyses, and classifications are to change and improve as much again within the next 10 years, many of the more important sites should be preserved in order to check theories, stratification, and conclusions.

It is of interest to review some of the contributions of the past 12 years. In my opinion the most important archeological contributions that have been made during this period are:

1. The general acceptance that man lived in North America contemporaneously with now extinct animals, such as *Bison taylori*, *Camelops*, mammoth, etc.; even though no exact dates can be determined, we are confident that these associations occurred some time between 10 and 20 thousand years ago.

2. Outlining the more important cultural manifestations in the Mississippi River Valley, especially in the Southeast.

3. Recognition of new archeological manifestations in the southern portions of New Mexico and Arizona.

4. The application of archeological techniques to the restoration and reconstruction of several early European settlements, such as Jamestown, Williamsburg, St. Augustine, and Plymouth.

These contributions should in no way detract from essential detailed studies that were made in other parts of the country. The four cited above, after all, form primarily a framework in which details will have to be grouped before the entire picture can be assembled and a masterpiece produced, provided, of course, that the artist or artists can be found to bring together all the elements required for such a painting. Explorations in other portions of the country have obtained important results and have contributed much to the details of previously outlined cultural patterns.

So far as Early Man in America is concerned, the relief agencies have played only a minor part. Most of the work during the past 10 years, which was concentrated on the excavation of Folsom or Yuma sites, was financed by more or less privately endowed institutions. The Lindenmeier site in Colorado, the Sandia Cave and Clovis-Portales sites in New Mexico, Gypsum Cave in Nevada, Signal Butte in western Nebraska, sites in north-central Texas, the Cochise complex in southern Arizona and New Mexico, sites in California and Oregon, and others in Utah and Minnesota have all contributed evidence toward the Paleo-

Indian problem in North America. The published accounts dealing with this subject have accumulated very rapidly during the past 12 years. In one of the recent summaries covering this field 112 publications were cited, all of which were printed since 1930.

As a result of these intensive studies one can now conclude from the archeological evidence that an essentially modern type of American Indian[3] migrated from Asia into North America about 15,000 years ago. The diagnostic features of his material culture as well as their association with certain extinct animals is well known. Aside from the importance of definitely establishing the antiquity of man in this hemisphere, these investigations have attracted the interest of geologists and paleontologists in that short but constantly expanding geological period, the Pleistocene, during which man became an integral part of the American fauna. Geologists as well as archeologists have developed a spirit of cooperation in these studies that never existed prior to 1930.

The second and, from my own point of view, the most important area in which archeological work has made the most rapid strides during the past 12 years is in the Southeast, especially in eastern Texas, Oklahoma, Louisiana, Alabama, Georgia, Florida, Tennessee, Kentucky, and Arkansas. Over 60 per cent (more than 1.5 million dollars a year) of the total allotments for W.P.A. archeological projects was assigned here. In other words, the amount of archeological explorations in this section of the Southeast is due almost entirely to the Federal allotments granted, through such agencies as C.W.A., F.E.R.A., W.P.A., and C.C.C., which provided the labor for extensive excavations.

Except for the archeological program of the Bureau of American Ethnology in Florida and the earlier surveys by C. B. Moore, no extensive explorations had been carried on in the Southeast before 1933. In the winter of 1933–34 the Smithsonian Institution sponsored 10 C.W.A. excavations in the Southeast. These experiments, together with those inaugurated by the T.V.A., led the way to subsequent large-scale programs in the various States. Some of the C.W.A. work in Florida was continued. In Georgia the city of Macon sponsored the large archeological program at Ocmulgee, which later became a National Historical Monument, and excavations were continued under the National Park Service; additional projects were completed on St. Simons Island near Brunswick; Irene Mound near Savannah; sites near Columbus; and a State survey. In northern Alabama work was concentrated in the Tennessee River Valley. All are familiar with the T.V.A. reports published in the Bureau of American Ethnology bulletins. The work in Mississippi was limited primarily to the Natchez Trace Survey. In Louisiana several projects concentrated on the Marksville and Tchefuncte problems.

As indicated before, the limited number of excavations in the Southeast prior to 1930 gave only a jumbled picture of certain exceptional sites which had produced unusual specimens. Nothing more than a guess gave any indication of the relative chronology. Many felt that the prehistoric ancestors of the Muskogeans, Natchez, Tunica, and other ethnological groups lived in the Southeast about the beginning of the Christian Era. Archeologists had a hunch that they were considerably influenced by some mysterious groups farther south in Mexico. Recent archeological excavations brought about a lengthening and foreshortening of the chronology in the Southeast. By this I mean that the finding of Folsom projectile points indicates that early man hunted over parts of the country. Even though no concentrated accumulation of such artifacts has been discovered in association with the extinct faunal complex farther west, a sufficient number of these diagnostic projectiles has been sent to the National Museum, as well as a large number discovered in our archeological collections from the Southeast, to indicate that Folsom man roamed the rivers and valleys for his sustenance. From such evidence it is certainly justifiable

[3] No human skeletal material has yet been found in direct association with the well-established archeological and paleontological strata.

to extend man's existence in the Southeast back at least to 10,000 years before the Christian Era. On the other hand, the chronology of the more sedentary groups, those lineal ancestors of the historically known Indian tribes, unquestionably has not only been condensed, but the cultural stratification much more sharply defined. Without repeating the various and innumerable foci thus far established, one can safely assume in a very general way that the archeological complexes appearing in the Southeast after the beginning of the Christian Era can be divided into three main divisions: early, middle, and historic.

By "early" is meant the widespread preagricultural complex characteristically associated with shell heaps. Throughout the Southeast these deposits are found along the coasts and along the banks of the larger inland rivers. The complex is characterized by mortars and pestles, tubular pipes, a large variety of shell beads and pendants, bone awls and tubes, and stemmed projectile points. The lower strata give no evidence of pottery, which would indicate preagriculture. This suggests a simple sedentary existence depending on hunting, fishing, and root- and berry-gathering. The most important sites containing this complex are Stallings Island in Georgia, Tchefuncte in Louisiana, Pickwick Basin in Alabama, and Indian Knoll in Kentucky. Pottery does occur in the later phases in all of these sites and consists uniformly of a crude fiber-tempered variety, probably the earliest type in the Southeast. There are minor variations from site to site, such as disc beads plastered on bone tubes with asphalt, from Indian Knoll in Kentucky; and different decorative treatments on the pottery. Nevertheless, not only are there sufficient differences between the various sites to show an adjustment to the local environment, but a general uniformity exists between the archeological complexes in the Southeast and the objects from similar sites in New England and the Pacific coast. This indicates a probable hemispheric similarity of a widespread cultural level.

So far as chronology of these people is concerned it can be safely assumed that they represent the first pottery-using people in the Southeast. As to whether they represent descendants from the much earlier Folsom hunters we have no evidence. My guess is that these semi-sedentary people represent a much more recent Asiatic migration of modern American Indians inhabiting the coasts and river valleys some time after A.D. 500. From this period up to A.D. 1800 archeologists in the Southeast have developed a most convincing series of cultural manifestations. These evolve from this early period through the various stages which led to the variety of historical Indian cultures found in the Southeast at the time of European discovery. Numerous outside influences account for these varieties. The introduction of maize, allowing more leisure and a more or less guaranteed staple food economy, permitted the development of complex political and religious organizations as well as the byproducts of large ceremonial centers, such as Ocmulgee, Etowah, Kolemokee, Moundville, Troyville, and Spiro. Large tribal migrations took place into the area as well as out of the Southeast. Even though some slight influence is obvious from farther south in Mexico, the only real proof of these contacts rests in artistic similarities, and these occur almost at the close of the protohistoric period, probably within the sixteenth or seventeenth century.

Cultural similarities have also been established between certain manifestations in the Ohio Valley and some of the Upper Mississippi Valley cultures. Numerous publications have described in detail the results from these W.P.A. archeological explorations; more will follow. One can safely assume, I think, that the broad outlines of the prehistoric cultures in the Southeast have been more or less established as to their relative chronology and cultural relations. Many more problems remain, especially the historical antecedence; in other words, the strict application of the historical method to Southeastern prehistory.

These accomplishments, when considered from the point of view of what was known prior to 1930, speak for themselves. Credit, it seems to me, must go first to the men re-

sponsible for outlining and directing the programs of research. Nevertheless they would still be working on their plans if the Federal and State relief agencies had not supplied the labor and material. Neither could have accomplished the results without the other. The same is true of the projects elsewhere.

The third most important archeological contribution during the past decade resulted from concentrated excavations in southwestern New Mexico and southern and northern Arizona. From scattered excavations in southern Arizona prior to 1930 a concerted effort has been made, both by well-organized programs and continuous excavations, to obtain data necessary to solve the problems of prehistory in this section of the Southwest as had been done in northern New Mexico and northeastern Arizona. The results of these investigations, entered into by various privately endowed organizations, have been published and provide a resume of the important cultural manifestations. These results together with the highly developed dendrochronology make it possible to observe cultural movements and variations, and enable the specialist to establish specific dates for the sites.

As a result of these concentrated programs the occurrence of two basic cultures in the Southwest can be postulated: The Anasazi and Hohokam. The ramifications of the Anasazi through the various Basketmaker and Pueblo stages is well known. The men working in the southern Arizona field propose that the earliest and most widespread complex, known as the Cochise, consisted of a simple hunting complex, the remains of which are found with certain extinct fauna which they have dated around 8000 B.C. From this hunting and gathering complex developed a more sedentary group out of which, about the beginning of the Christian era, two variations developed, the Mogollon and the Hohokam.

These people lived in large communities and made fine undecorated pottery and artistically carved stone objects—all in all a rather closely knit, well-developed, sedentary culture. During this same period the people known as the Basketmakers lived in caves and shelters in northern New Mexico, wove beautiful sandals, and made artistically decorated coiled baskets. These two centers of cultural influence continued to expand; then contact and an interchange of ideas took place between the north and south. About A.D. 1000 the Hohokam reached the peak of its cultural influence, and the now well-established Pueblo cultures in the north began to expand to the south. About A.D. 1200 this northern Pueblo culture began a definite southward movement, forcing its influence through the Salado group upon the Hohokam and began the latter's eventual decline. The Pueblos, owing to catastrophic droughts were forced out of the San Juan drainage, and owing to somewhat similar ecological factors spread southward. The droughts also caused a decrease in their area of domination and resulted in several regional and somewhat culturally separable groups. About A.D. 1600 the picture is well known from historical accounts, with the Hopi in Arizona, the Zuñi in New Mexico, the Pima along the Gila and Salt Rivers, while the Papago were spreading farther south.

Definite cultural influences, coming from centers farther south in Mexico, have been found in these southern Arizona sites; while pottery and other culture material from the Great Plains area has been found among the Pueblo cultures in northern New Mexico. These represent only the highlights from an area which in 1930 was considered drained so far as new archeological manifestations were concerned.

The fourth outstanding accomplishment is the application of modern archeological techniques to recovering, verifying, and supplementing historical accounts of early European settlements in the United States. This approach differs only in point of time and cultures involved. Ever since the archeologist emphasized the historical approach instead of trying to accumulate quantities of beautiful pottery or arrowheads and pipes, he became a collaborator with the student of history and the ethnographer. Since 1930 this technique has proved its value in supplementing and verifying the

limited written accounts dealing with some of the first European settlements in America.

The best-known example and one of longest duration is the work at Jamestown Island, Va. Similar approaches were made at St. Augustine, Fla., and quite recently in and around Plymouth, Mass. At Jamestown historical and archeological research are working together to unravel the story of the years between 1607 and 1699, at which time Jamestown was the outstanding community in the colony of Virginia. The historical records of this first century of English colonization of America are meagre. The settlers were naturally too busy trying to keep body and soul together to do much recording for the edification of their descendants. Many of the records that were made have been destroyed or lost. Moreover, even as today, people seldom preserved records of their houses, furniture, dishes, and the like. Many of these, especially the nonperishable type, such as rum bottles, spoons, buckles, seals, and china, are being recovered through controlled archeological excavations. On the other hand, the existing documents, such as maps, deeds, and court records, assist in determining facts that no amount of excavation could produce. The important contribution is that both disciplines, history and archeology, are working together toward the solution of specific problems. This type of collaboration at the most recent end of our time scale is just as important as collaboration between the Pleistocene geologist or paleontologist and the archeologist at the extreme opposite end of our human history scale. This combination of efforts or techniques appears to me to cover the whole field of anthropology; functional or applied anthropology bridges a similar gap between ethnology and sociology. Similar examples could be cited for geography, economics, psychology, biology. The new science seems to be "growing up" and expanding in every direction.

Getting back to archeology, I feel confident that historical-archeology[4] will continue to play an important part in the restoration of sites historically associated with our own European cultures and from the point of view of popular interest will play a very prominent part in supplementing the cultural background of our own ancestors.

Many other contributions have been made in those sections of the country which have not been stressed. There is the taxonomic classification, the reanalysis of earlier archeological excavations, the archeological survey of Kansas, explorations in Maine, New York and Pennsylvania, the work at the Kincaid site in southern Illinois, and the excavation of the Angel Mound group in southwestern Indiana. To these may be added dendrochronology in the Mississippi Valley from which some definite dates have been determined.

One is always limited in preparing a summary of this kind. I have endeavored to select those phases of the work that in the light of present conditions have contributed most to our knowledge of prehistoric man in the United States. At the same time I have tried to point out the unusual social conditions that made possible the large-scale archeological operations.

[4] A poor name. Perhaps Colonial-archeology would be a better term, although such a collaboration of two disciplines would not necessarily be limited to the Colonial period.

BOTANY.—*Two new dwarf species of* Rubus *from western China and Tibet and their Asiatic relatives.*[1]

EGBERT H. WALKER, U. S. National Herbarium.

Several species of dwarf *Rubus* occur in the area from western North America, through Kamchatka, the Far East, Japan, China, and Tibet, the exact relationships of which are uncertain. To these the writer is now adding the two new species described in this review. Both belong in the subgenus *Cylactis* Focke, according to the recent characterization of the group by L. H. Bailey.[2] He places in this group the western North American species *R. lasiococcus* A. Gray and the eastern Asiatic and western North American species *R. pedatus* J. E. Smith, and, if he were not confining his studies to the North American species, would probably include also the Asiatic species *R. fockeanus* S. Kurz, *R. rubrisetulosus* Cardot, and possibly *R. potentilloides* W. E. Evans. Focke has placed most of these species in the subgenus *Dalibarda*,[3] based on *Dalibarda repens* L., 1753 (*Rubus dalibarda* L., 1764), which Bailey maintains as a separate genus.[4] To the writer, however, the segregation of this as a separate genus seems untenable, because it is distinct only in respect to its cleistogamous flowers, a character that seems to be no greater a criterion for generic segregation than is the character of dioecious flowers used to set aside the subgenus *Chamaemorus* within the genus *Rubus*. *Dalibarda* as a genus or subgenus has been variously treated, and the species assigned to it have been equally variable in the extensive literature on the genus.

This assemblage of Asiatic species, which may thus be provisionally considered in the subgenus *Cylactis*, may be distinguished by the following key:

a^1. Leaves mostly 5-foliolate.
  b^1. Carpels about 5; leaflets toothed, not deeply lobed.
    c^1. Peduncles more than 1 cm long; sepals oblong-ovate, acute to obtuse.....1. *R. pedatus*
    c^2. Peduncles 1 cm long; sepals ovate, long acuminate to caudate....3. *R. yui*
  b^2. Carpels about 20; leaflets deeply lobed [ex char.].....5. *R. potentilloides*
a^2. Leaves mostly 3-foliolate.
  b^1. Leaves serrate or doubly serrate, more than 1 cm wide; sepals lanceolate and setulose or ovate and not setulose; stipules entire or 1- to 5-toothed.
    c^1. Stipules entire or 1-toothed.
      d^1. Sepals ovate; leaves coarsely and doubly serrate; carpels 12 to 20.....2. *R. fockeanus*
      d^2. Sepals lanceolate or oblong lanceolate; leaves rather finely and simply serrate; carpels about 6.....3. *R. yui*
    c^2. Stipules 3- to 5-toothed or incised.....4. *R. rubrisetulosus*
  b^2. Leaflets deeply lobed or incised, less than 1 cm wide; sepals broadly ovate, not setulose; stipules entire.
    c^1. Carpels 24; petals entire or sinuate [ex char.].....5. *R. potentilloides*
    c^2. Carpels about 3; petals lobed or coarsely toothed...6. *R. clivicola*

1. **Rubus pedatus** J. E. Smith, Pl. Icon. Ined. 3. *pl. 63.* 1791; W. O. Focke, Sp. Rub. 16. 1910 (Bibl. Bot. 17[2]); L. H. Bailey, Gentes Herb. 5: 40. 1941.

Based on a collection by A. Menzies from western North America. The type has not been examined.

Distribution: From northern California, Idaho, and Montana to Alaska and Japan.

[1] Published by permission of the Secretary of the Smithsonian Institution. Received June 12, 1942.

[2] Gentes Herb. 5: 21. 1941: "Plant unarmed, with wiry thinly woody or almost herbaceous stems often prostrate or running, with no clear distinction of primocanes and floricanes . . . ; leaves lobed or ternate; stipules broad, attached on axis but sometimes also adnate at base to petiole; flowers solitary or very few." On p. 24 it is described thus: "Plants low, often repent, unarmed or bearing a few weak bristles, without definite primocane and floricane succession, stems more or less herbaceous to thin and somewhat ligneous; leaves various; flowers hermaphrodite but sometimes functionally asexual, borne few to several on a branched or forked leafy weak stem; fruit blackberry-like. Mostly high northern."

[3] Focke, in Species Ruborum, p. 13. 1910, describes *Dalibarda* as follows: "Calyx fere rotatus, cupula brevis plana; stamina in anthesi divaricata; carpella pauca (saepissime 5) vel complura (ad 20), discreta, matura aut sicca, aut succosa.—Herbae perennes, reptantes, humiles (calyce *R. Fockeani* excepto) inermes, non setoso-glandulosae; stipulae liberae, persistentes, in plurimis speciebus latae. Species paucae, inter se parum affinis, sed omnes humiles, herbaceae, reptantes, inermes."

[4] In Gentes Herb. 5: 21. 1941, he excludes *Dalibarda* from *Rubus* "because of its few pistils not placed on a developed torus and its cleistogamous flowers." Elsewhere he has referred to the dry, non-fleshy fruits.

Asiatic specimens examined: JAPAN: *Tsunezo Takemoto* 1195 (A)[5]; *Kakuo Uno* 16938 (A), 17304 (A); *E. H. Wilson* in 1914 (without number) (A).

2. **Rubus fockeanus** S. Kurz, Journ. Asiat. Soc. Bengal **44**[2]: 206. 1875; Hook. f. Fl. Brit. Ind. **2**: 334. 1878; W. D. Focke, Sp. Rub. 16. 1910.

Based on collections, probably by J. D. Hooker and C. B. Clarke, "in pascuis alpinis, Sikkim-Himalaya, e.g., in jugis Singalelah, 12–14000 ped. s. m." (See the original description and Hooker's Flora of British India.)

Synonym: *R. loropetalus* Franch. Pl. Delav. 203. 1889. Based on Delavay 2837, from Yunnan. A photograph in the Arnold Arboretum of the type in the Paris herbarium has been examined. For note on this reduction see comments with Cardot's description of *R. rubrisetulosus*, and Focke in Notes Bot. Gard. Edinburgh **5**: 71. 1911.

Distribution: Hupeh, China, to Sikkim, India.

Chinese specimens examined: YUNNAN: *Delavay* 2837 (photo and fragment) (A), Apr. 6, 1889 (W), July 9, 1889 (G, W), 1889 (W); *Forrest* 5679 (W); *Handel-Mazzetti* 3281 (W); *Rock* 4738 (W); *C. W. Wang* 68494 (A); *T. T. Yü* 15984 (A, W). SZECHWAN: *Handel-Mazzetti* 7225 (A); *E. H. Wilson* 1002 (A). HUPEH: *A. Henry* 6839 (G, W).

3. **Rubus yui** Walker, sp. nov.

Humilis inermis, caulibus reptantibus suffruticosis, junioribus pubescentibus pilis albis subappressis et pilis erectis glandulosis; stipulae liberae ovatae acutae vel obtusae; folia 3-5-foliolata, orbiculata, 3–5 cm diametro, petiolata (1–5 cm), molliter pubescentia et glanduloso-pubescentia praecipue in nervis, foliolis late ovatis vel orbicularibus obtusis duplo-serratis; ramuli floriferi circa 10 cm longi, uniflori; calyx circa 8 mm longus, intus valde pubescens extra ad basin glanduloso-pilosus, lobis late ovatis longe acuminatis vel caudatis; stamina complura biseriata in margine tori lati inserta; carpella circa 6; fructus globosus, circa 1 cm diametro, ut videtur succulentus.

A low repent, radicant, suffrutescent, unarmed plant with indumentum of soft white, subappressed hairs and much longer erect glandular hairs on younger stems, petioles, leaves (sparingly), and calyx; creeping stems rather slender, branching, brownish, the 1-flowered erect branches about 10 cm long; stipules free from the petiole, ovate, acute, to obtuse, asymmetric, pubescent, 5 to 10 mm long, appearing scalelike on creeping parts; leaves with petioles 1 to 5 cm long, 3- to 5 foliolate, orbicular, 3 to 5 cm broad, the leaflets shortly petioluled, 1.5 to 3 cm long, broadly ovate to orbicular, rounded at apex, cuneate to truncate at base, sometimes slightly lobed, coarsely and more or less doubly serrate, sparingly soft pubescent and glandular on both surfaces but especially on the veins; flowers white, terminal, solitary, usually subtended by a leaf, apparently nodding, nearly 2 cm in diameter, the peduncle scarcely 1 cm long; calyx deeply 5-lobed, the lobes broadly ovate and long acuminate or caudate (1.5 to 3 mm), 8 mm long, soft pubescent especially within, glandular-hairy at base; petals probably 5, elliptic ovate, obtuse, entire, 10 to 12 mm long, glabrous, veined; stamens numerous, biseriate, unequal in length, on margin of a wide torus-cup, about half the length of the calyx lobes, the anthers small, orbicular, the filaments rather broad; carpels about 6, the style 1.5 mm long, the ovary 1 mm long, glabrous; fruit globose, about 1 mm in diameter, crimson, apparently somewhat fleshy.

Type in the herbarium of the Arnold Arboretum collected by T. T. Yü, no. 19840, at Lungtsahmuru in the upper Kiukiang Valley, Yunnan, in an *Abies* forest at 3,800 meters altitude, August 9, 1938; reported to be common. Additional specimens examined, also at the Arnold Arboretum, are *T. T. Yü* 19303, collected at Newahlung, Salwin-Kiukiang Divide, Yunnan, under a rhododendron-bamboo thicket at 3,500 meters altitude, July 11, 1938, also common; *C. W. Wang* 65818 (in fruit) collected at "Gue-sai-gue, Tsa-wa-rung," Sikang, on the border of a woods, at 3,200 meters altitude, August, 1935.

This species seems most nearly related to *R. fockeanus* S. Kurz but differs in its ovate rather than lanceolate or oblong-lanceolate sepals and petals, fewer carpels, more coarsely and doubly

[5] The locations of the specimens examined are: A, Arnold Arboretum; G, Gray Herbarium; W, U. S. National Herbarium.

serrate leaves and often five leaflets. It also resembles *R. pedatus* J. E. Smith but differs in its coarser stems, larger flowers, broadly ovate, long acuminate or caudate sepals, and shorter pedicels. From *R. rubrisetulosus* Cardot it differs in its entire stipules and broader, less setulose sepals.

4. **Rubus rubrisetulosum** Cardot, Not. Syst. (Lecomte) **3**: 289. 1917.

Based on a collection by A. David in 1870 in the Paris herbarium (?) from "province de Moupine,"[6] Szechwan.

Distribution: Tibet, Yunnan, and Szechwan.

Specimens examined: YUNNAN: *Handel-Mazzetti* 8887 (A); *T. T. Yü* 68044 (A), 68204 (A), 68204A (A).

5. **Rubus potentilloides** W. E. Evans, Notes Bot. Gard. Edinburgh **12**: 179. 1912.

Based on Ward 1777 (type), 3166, 1132, all from Upper Burma. No specimens have been seen.

6. **Rubus clivicola**[7] Walker, sp. nov.

Humilis inermis, caulibus reptantibus suffruticosis, junioribus pubescentibus; stipulae liberae, ovatae vel suborbiculatae, integrae; folia trifoliolata orbicularia, 0.8–1.5 cm diametro, petiolata (circa 8 mm longa), subtus molliter pubescentia et parce glanduloso-pubescentia, foliolis valde 3-lobatis, lobis alte fissis, apice rotundatis, acutis vel obtusis; ramuli floriferi breves, uniflori; calyx circa 7 mm longus, externe pubescens, lobis late ovatis longe caudatis; petala lobata vel grosse dentata; stamina circa 30, uniseriata inaequalia; carpella circa 3; fructus ignotus.

A low, repent, radicant, suffrutescent, unarmed plant with indumentum of soft white hairs on younger stems, petioles, leaves (especially on veins of lower surface), and calyx lobes and scattered shorter brown glandular hairs especially on the leaves; creeping stems slender, wiry, dark reddish brown, the flowering branches scarcely 2 cm long, 1-flowered; stipules free from the petiole, scarious, ovate to suborbicular, entire, more or less ciliate, often occurring on the creeping stems as scales; leaves with pubescent petiole about 8 mm long, trifoliolate, orbicular, 0.8 to 1.5 cm broad, the leaflets petioluled (the central one longest), deeply 3-lobed (each lobe deeply divided), obtuse at base, the lobes rounded and acute to obtuse at apex, the veins rather prominent beneath (but less so than in *R. fockeanus*); flowers terminal, white, about 1 cm broad, the peduncle about 1 cm long; calyx deeply 5- (sometimes 4-) lobed, the lobes broadly ovate, caudate (1 mm), 5 to 6 mm long, softly pubescent especially on the margin; petals 5 (sometims 4), ovate, lobed or coarsely toothed, about 7 mm long, glabrous; stamens about 30, uniseriate, of several lengths, the anthers small, ovate, the filaments broad; carpels about 3, about 2.5 mm long, the ovary 0.75 mm long, glabrous, the style rather slender, 1.5 mm long, the stigma abrupt; fruit unknown.

Type in the United States National Herbarium, no. 1512903, collected by J. F. Rock, no. 23317, on a mossy scree at 4,200 meters altitude in mountains of Tjonatong, Upper Salween River, Tsarong Province, southern Tibet, June-July, 1932, on the expedition of the University of California Botanical Garden to southwestern China. Additional specimens examined, all from Yunnan and all in the herbarium of the Arnold Arboretum, are: *Handel-Mazzetti* 9197[8] from near the Yunnan-Tibet-Burma border between the Salween and the Irrawadi Rivers, "in pluviisilvis mixtis temperatis vallis Tjiontson-lumba infra Tschamutong," at 3,050 meters altitude, July 2, 1916; *T. T. Yü* 19277 from Newahlung on the Salwin-Kiukiang Divide, common on a rocky surface under a shady forest at 2,800 to 3,000 meters altitude; *T. T. Yü* 22082 from Swang-Chiang on the Salwin-Kiukiang Divide, common on a rocky mountain slope at 2,800 meters altitude.

In its deeply divided leaves this species seems to resemble *R. potentilloides* W. E. Evans, but it differs from the original description in its distinctly lobed or coarsely toothed petals, far fewer carpels (3 rather than 24), and uniseriate (rather than biseriate) stamens.

[6] For explanation of the misuse of this name by David, see notes by W. P. Fang in Contr. Biol. Lab. Sci. Soc. China Bot. Ser. **12**: 4. 1939.

[7] This name, meaning an inhabitant of the slopes, is selected because most of the specimens examined were collected on screes or other rocky slopes.

[8] This number and no. 8339 are cited in Handel-Mazzetti, Symbolae Sinicae, as *R. potentilloides* W. E. Evans, but they do not conform with the original description of that species in respect to the number of carpels, number of stamen series, and petal-lobing.

ZOOLOGY.—*Porifera from Greenland and Baffinland collected by Capt. Robert A. Bartlett.*[1]

M. W. DE LAUBENFELS, Pasadena Junior College. (Communicated by WALDO L. SCHMITT.)

The collections of Arctic sponges on which this report is based were dredged by Capt. R. A. Bartlett in August 1927, July 1931, August and September 1933, and July 1940. Twenty-one species are represented. Nine species and one genus are new.

Class DEMOSPONGIAE

Haliclona permollis (Bowerbank)

This species was described as *Isodictya permollis* by Bowerbank (1866, p. 278). It is one of the few sponges with a wide distribution taken by Captain Bartlett; it is cosmopolitan and abundant.

The specimen in the present collection is a mass a little over 1 cc in size. The spicules and their arrangement are typical. In other respects the smallness of the specimen precludes satisfactory comparison. It was dredged in Fox Basin, lat. 66° 43′ N., long. 80° 07′ W., at a depth of 32–37 fathoms, August 12, 1927.

Isodictya histodermella, n. sp. Fig. 1 A

The holotype (U.S.N.M. no. 22688) was dredged July 22, 1940, at a depth of 60 fathoms, Parker Snow Bay, NW. (true) of Conical Rock. A second specimen was dredged August 12, 1927, in Fox Basin, lat. 66° 43′ N., long. 80° 07′ W. This is a fragment of finger-sized projection similar to those on the larger specimen.

The holotype is a palmate-shaped mass with several projections the size and shape of fingers. The whole is 15 cm high and between 1 and 2 cm thick. The consistency is spongy, and the color the usual pale drab of sponges that have been preserved for some months. The surface is nearly smooth, microscopically slightly hispid, with no detachable or special ectosome present. The oscules are 2 to 3 mm in diameter, mostly scattered, occurring chiefly along the narrower edges of the digitate projections. The endosome is somewhat cavernous, the interior being much more "open-work" than the outer portion, so that the sponge may almost be described as "hollow." The megascleres are oxeas approximately 14 by 270μ. The microscleres are palmate isochelas 30 to 40μ long.

The specific name is given in recognition of the structural resemblance of this sponge to specimens of the genus *Histodermella*, which is remarkable for having just such an open-work but not quite hollow interior. In other respects the resemblance ceases. The spiculation in particular is very different. No other species of *Isodictya* is especially close to the one under discussion; it may, however, be compared with the genotype, *Isodictya palmata*, originally described as *Spongia palmata* by Lamarck (1814, p. 452). Superficially the genotype looks like *Isodictya histodermella*, but its interior is far less cavernous. The microscleres of *I. palmata* (Fig. 1, B) are rather peculiar in shape, whereas those of the species here described are typical isochelas.

Orina consimilis (Lundbeck)

This species was described from the Arctic, as *Gelliodes consimilis* by Lundbeck (1902, p. 77). A very similar species is the sponge described as *Gellius arcoferus* by Vosmaer (1885, p. 29). The latter is also Arctic, as are many other species and specimens of the genus *Orina*.

The specimen in the present collection, taken August 31, 1927, at the southeast corner of Fox Basin, lat. 66° 46′ N., long. 79° 15′ W., is remarkable for having toxas of two thicknesses. The larger are about 5 by 100μ, the smaller only 2 by 100μ. For this reason one might be tempted to describe it as a new species, but the other characters are typical.

Iophon piceus (Vosmaer)

This species was described as *Alebion piceum* by Vosmaer (1882, p. 42), from the Arctic. It is here proposed that the following species be dropped in synonymy to *piceus: Reniera dubia* Hansen (1885, p. 5), from the Arctic, and *Iophon frigidus* Lundbeck (1905, p. 183), from Greenland. Neither *piceus* nor *dubia* is adequately known, but from what information is available they seem to be conspecific with the well-described *frigidus* and the specimens under discussion. The latter have megascleres and anisochelas only about 70 per cent as large as those of Lundbeck's Greenland species, and have bipocilli far more abundant. These differ-

[1] Received May 25, 1942.

ences, however, do not warrant setting up a new species for Bartlett's material, which consisted of two Fox Basin specimens, one from lat. 66° 43′ N., long. 80° 07′ W., August 12, 1927, from a depth of 32–36 fathoms; the other without detailed locality data, taken August 26, 1927, from 25–31 fathoms.

Myxilla incrustans (Johnston)

This species was described as *Halichondria incrustans* by Johnston (1842, p. 122). It is abundant in the north Atlantic and Arctic regions. Captain Bartlett dredged this sponge at 32–37 fathoms in Fox Basin, lat. 66° 43′ N., long. 80° 07′ W., August 12, 1927, and at a depth of 32–37 fathoms on August 13, 1927.

Myxilla acribria, n. sp. Fig. 1 C

The holotype (U.S.N.M. no. 22689) was dredged in Fox Basin in 1933; detailed locality data are lacking. It is an amorphous mass 1 by 1.5 by 2 cm in size. The consistency is spongy and the color dull brown. The surface is finely hispid and lipostomous. The structure consists of plumose ascending columns, with the same sort of spicules echinating and coring the tracts.

The principal megascleres are commonplace smooth styles 12 by 465μ. There are some special dermal tylotes with microspined heads; total size about 9 by 375μ. The microscleres are anchorate isochelas as typical of this genus, but are a little larger than common, often up to 90μ in length.

The genus *Myxilla* is represented by many Arctic species, some of which are common. The present specimen is as different from these other Arctic Myxillas as could well be and still be left in the genus. On the other hand, it is almost identical with one of the few species of this genus from the southern hemisphere. Ridley and Dendy (1886, p. 472) in their "Preliminary Report on the Monaxonida collected by H.M.S. *Challenger*," described *Myxilla cribrigera* from Chile. The specimen collected by Captain Bartlett in Greenland bears an amazing resemblance to *M. cribrigera* in all characters except the important one which Ridley and Dendy selected as a basis for their specific name. Their specimen had well-defined pores arranged in special inhalant areas. The Greenland specimen conspicuously lacks this cribrous structure, which together with the vast geographical separation, seems to warrant naming it *acribria*, rather than identifying it as *cribrigera*.

Mycale vosmaeri (Levinsen)

This species was described from the Arctic by Levinsen (1886, p. 20) as *Esperella vosmaeri*. Brøndsted (1914, p. 489) maintained that it was conspecific with *Mycale lingua* (described as *Hymeniacidon lingua* by Bowerbank, 1858, p. 305), and his opinion has been generally followed in this regard. This assumes that *M. lingua* is a highly variable species and that *vosmaeri* falls within the range of variation. I disagree, and propose that *vosmaeri* be reinstated as a valid species.

Captain Bartlett dredged this *Mycale* three times: Fox Basin, August 13, 1927, in 34–37 fathoms, and August 26, 1927, in 25–31 fathoms; and Parker Snow Bay, NW. Greenland, July 22, 1940, in 25–45 fathoms.

Levinsen's species was supposed to differ from Bowerbank's by lacking the smaller type of anisochelas and by having much smaller sigmas. In some specimens of *lingua* the smaller anisochelas do not seem to be of a conspicuously smaller range, but in all Captain Bartlett's specimens, as in Levinsen's, there seems to be no smaller type of anisochela at all. In all Captain Bartlett's specimens the sigmas are even smaller (10 to 12μ) than in Levinsen's (20μ); in typical *lingua* they are 27 to 32μ. These sigmas in *vosmaeri* are more strongly contorted than in typical *lingua*. In typical *lingua* the megascleres are smooth substrongyles 750 to 850μ long, but in Levinsen's specimen they are 650μ long, and in those collected by Captain Bartlett they range from 600 to 680μ.

Echinoclathria schmitti, n. sp.

The holotype (U.S.N.M. no. 22690) was dredged in Fox Basin, at a depth of 34–37 fathoms, lat. 66° 46′ N., long. 79° 15′ W., August 13, 1927. It is a lamella or fragment of a vase; the piece of the wall is 7 mm thick and 5 cm high. Foreign objects, since removed, have left two cavities 7 mm in diameter, clear through the wall. The consistency is spongy and the color light brown. The surface is even, punctiform, with pores 50μ in diameter, 125μ apart (center to center). The numerous oscules are a trifle under 1 mm in diameter, about 4 mm apart. There is no ectosomal specialization. The

endosome consists of specular tracts about 100μ in diameter, in a confused specular matrix. The latter could be interpreted as representing specular connections between the tracts, or loosely echinating spicules on them.

The only spicules are styles; many are about 4 by 200μ, and many others 12 by 220μ. One might regard these as two distinct types, but there are fairly numerous intermediate-sized spicules.

The only other species of *Echinoclathria* that is very close to this one is the genotype *E. tenuis* Carter (1885, p. 355), from south Australia. The two are very close indeed. There are two reasons for establishing a new species for the Arctic sponge. One is the vast distance between Greenland and Australia, which is certainly inadequate by itself alone but is significant in connection with other differences. The other and more critical difference is that in *tenuis* the interstitial spicules are tylostyles quite unlike those in *schmitti*. Brøndsted (1933, p. 14) described two sponges from Greenland that are practically certainly conspecific with *schmitti*. He very dubiously identified them with *Phakellia beringensis* Hentschel (1929, p. 975). This species is named for Dr. Waldo L. Schmitt, of the United States National Museum.

Halichondria fibrosa (Fristedt)

This species was described as *Amorphina fibrosa* by Fristedt (1887, p. 426), from the Arctic.

Captain Bartlett dredged this species on September 5, 1933, between the Island of Ooglit and the Eskimo village of Pingitkalik, northeast of Melville Peninsula, Fox Basin, near the entrance to the Fury and Hecla Straits. Earlier, on August 26, 1927, he dredged a sponge from Fox Basin, in 25–31 fathoms, that is probably conspecific. It is similar in spiculation and structure but is different in external shape. One side is astonishingly smooth and imperforate, as if it had been closely affixed to some smooth flat substratum. The other side is extremely cavernous, as though it had been loaded with foreign objects since removed.

Cioxeamastia, n. gen.

This genus is erected for the following species (*C. polycalypta*) as genotype. It is of the family Halichondriidae, with spiculation and most other characters quite typical, but differs in possessing conspicuous closed fistules closely resembling those that characterize the genus *Polymastia* of the family Suberitidae. The genus *Ciocalypta* of the Halichondriidae also has fistules, but these are coarser than those of *Cioxeamastia*. The spiculation of *Ciocalypta* is not typical of its family.

Cioxeamastia polycalypta, n. sp.

The holotype (U.S.M.N. no. 22691) was dredged in Fox Basin at a depth of 34–37 fathoms, August 13, 1927. It is subspherical, 3 cm in diameter, with about 50 closed fistules of the *Polymastia* type, each 1 by 3 mm in transverse section and 4 mm high. The consistency is spongy and the color pale dull yellow. The surface is smooth and lipostomous. The ectosome is not detachable or conspicuously different from the rather dense endosome; in this regard it is not typical of the Halichondriidae. The spicules, as in *Halichondria*, consist of oxeas of great variation in size and in more or less confusion; most of them range in size from 4 by 200 to 12 by 700μ.

Hymeniacidon heliophila (Parker)

This species was described as *Stylotella heliophila* by Parker (1910, p. 766) in his famous discussion of the development of the nervous system. His species is a typical *Hymeniacidon* and is extremely close to *H. carnuncula*, the common European *Hymeniacidon*. The two may be synonymous. The Greenland specimen is definitely more like the American-Atlantic species (*heliophila*) than the European-Atlantic ones.

Captain Bartlett took this sponge while otter-trawling off Wolstenholm Island, northwest Greenland, in 13–25 fathoms, on July 23, 1940.

Polymastia bartletti, n. sp.

The holotype (U.S.N.M. no. 22692) was dredged in Fox Basin, lat. 67° 45′ N., long. 79° 09′ W., at 38 fathoms on August 24, 1927. It is subspherical, about 6 cm in diameter, and somewhat flattened on top and bottom. The consistency is firm but elastic, and the color a very pale yellow. The surface is very smooth except that there are about a dozen large conules or fistules about 6 mm high and 6 mm diameter at the base, together with several dozen smaller conules about 1.5 mm high and

2 mm diameter. No oscules are evident. The ectosome is a dense cortex 1.5 to 2 mm thick. The endosome is "crumb-of-bread" and more of the ochre-yellow than is the (paler) cortex.

The ectosomal spicules are tylostyles 6 by 350 to 6 by 400μ, erect, with points toward the exterior. The endosomal spicules are tylostyles 9 by 540 to 12 by 600μ; the larger each is, the less pronouncedly tylote it is. Most of these are arranged in rough tracts about 130μ in diameter. Between these, there are many spicules strewn in confusion, some of which are as small as 4 by 200μ.

But for the cone-shaped fistules this would be a typical *Suberites*. One would suggest comparison with *Suberites insignis* Carter (1886, p. 118), from south of Australia, which is described as resembling a nudibranch, but unfortunately not figured. The present species differs from most of the representatives of the genus *Polymastia* in that the latter have much longer fistules. There are, however, two already described with very low fistules, as follows: *Polymastia laganoides* Lambe (1894, p. 129) from Bering Sea (Arctic), which has three sizes of spicules and is probably most closely related to *P. bartletti;* and *Polymastia megasclera* Burton (1934, p. 567), from Australia, which has extremely large spicules.

This species is named in honor of Capt. Robert A. Bartlett.

Tentorium semisuberites (Schmidt)

This species was described as *Thecophora semisuberites* by Schmidt (1870, p. 50) from Greenland. Lambe (1896, p. 198) recorded it from northeastern Canada. The specimen collected by Captain Bartlett is astonishingly like Schmidt's original, even to having just four symmetrically placed oscular chimneys on the dome-shaped upper surface. It was dredged at 20–30 fathoms on September 3, 1933, at the entrance to Fury and Hecla Straits.

Class HYALOSPONGIAE

Trichasterina sagittaria Topsent

This species was described by Topsent (1913, p. 9) from the Arctic. The specimen collected by Captain Bartlett was dredged at a depth of 110 fathoms on July 29, 1931, off East Greenland, lat. 74° 21′ N., long. 16° 30′ W.

Acanthascus nealus, n. sp. Fig. 1 E

The holotype (U.S.N.M. no. 22693) was dredged at 120 fathoms depth on July 30, 1931, off East Greenland, lat. 74° 04′ N., long. 17° 58′ W. It is a cone-shaped vase and shows no certain indication of having been erect. It is 10 cm long and 10 cm diameter, with walls about 1 cm thick. The consistency is fragile and the color dirty drab. The walls are pierced by canals of three sizes; the largest are 3 mm in diameter, the medium ones nearly 1 mm in diameter, and the abundant smaller ones are microscopic. The surface is nearly smooth, not at all hispid.

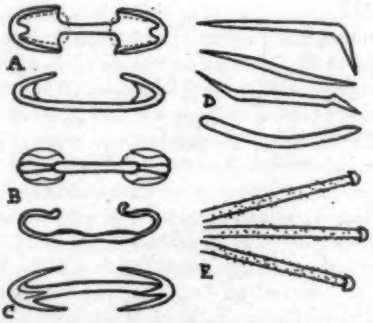

Fig. 1.—A, Microscleres of *Isodictya histodermella*, n. sp., ×750; B, microscleres of *Isodictya palmata*, from Bowerbank, "Monograph of the British Spongiadae," 1866, plate 52, ×750; C, microscleres of *Myxilla acribria*, n. sp., ×250; D, microscleres of *Leucettusa usa*, n. sp., ×205; E, microscleres of *Acanthascus nealus*, n. sp., ends of the discoasters, ×500.

Another specimen was dredged the same day at the same place. There are a number of fragments each about the size of the palm of the hand. It would appear that if fitted together correctly they would form a cone-shaped vase 15 cm long and 11 cm in diameter at the open end. This vase, however, to judge from its attachments to rocks, was decidedly not upright, but lay on its side as it grew. The pointed end clearly shows that it was not attached. The walls vary from 5 cm thick at the open end of the cone to 15 mm thick as the closed (pointed) end of the cone is approached.

The bulk of the spiculation consists of diactines up to 65μ in diameter and 20 mm long. These make a felted mass. Their ends often are strongylote and microspined. The dermal and

so-called gastral spicules are regular hexactines, each ray about 10 by 200μ and entirely microspined; a few are pentacts and stauracts. They are somewhat smaller in the smaller of the two specimens. The microscleres consist of abundant commonplace oxyhexasters 125μ in diameter, and discohexasters of the same diameter. The latter were not found in the second (larger) specimen but may have been really present, or possibly washed out as the specimen was in a damaged condition. They are not typical for this genus.

In spite of minor differences these two specimens may be confidently regarded as conspecific. The evidence that they grew naturally on one side is not regarded as peculiar; many other Hyalospongia may have grown similarly, but once detached from the bottom by a dredge they cease to give evidence thereof. It is suggested that such tilted positions are associated with a bottom current regularly in one direction rather than currents coming at one time or another from different directions. There are now six species of this genus.

Three are decidedly hispid:

A. cactus Schulze (1886, p. 48), the genotype, from Japan, has dermal and gastral pentacts where most of the others have hexacts. The shape is cylindrical.

A. platei Schulze (1899, p. 45), from California, is like the above but with dermal and gastral hexacts.

A. grossularia Schulze (1886, p. 48), from the Antarctic, is similar to both the above but has two sorts of discohexasters instead of one.

Three are smooth, not hispid:

A. pachyderma Okada (1932, p. 94), from Japan, is similar to *platei* except for being smooth surfaced, thick-walled, and oval.

A. alani Ijima (1898, p. 55), from Japan, is like the above except that it has two sorts of discohexasters instead of one.

A. nealus (new species) from Greenland is similar to *pachyderma* except that it is thin-walled and conical.

Class CALCISPONGIAE

Leuconia ananas (Montagu)

This species was described by Montagu (1812, p. 97) as *Spongia ananas*. It is fairly common in the Arctic and about the Scandinavian coasts.

Captain Bartlett dredged two specimens of this sponge on August 4, 1927, in 25 fathoms, 4 miles east of Cape Dorchester, and one other specimen in Fox Basin, August 26, 1927, at 25–31 fathoms. All three specimens are more distinctly pedicillate than usual for this species.

Sycandra hebe, n. sp.

The holotype (U.S.N.M. no. 22694) was dredged on August 12, 1927, at a depth of 32–37 fathoms, in Fox Basin, lat. 66° 43′ N., long. 80° 07′ W. It is a cylinder 11 mm high. The lower half is nearly solid and only 1 mm in diameter. The consistency is as fragile as in most Calcispongiae, and the color is the usual white. The surface is fairly smooth. The terminal cloaca is less than 1 mm in diameter. The walls are about 170μ thick, containing often only a single layer of flagellate chambers about 80μ in diameter, 160μ long.

The bulk of the spiculation consists of regular triaxons with rays 5 by 50 to 8 by 120μ. There are diactines with one ray only about 20μ long, at 120° to the other, which is nearly 300μ long; their diameter is 15μ. These occur felted in the wall, often protrude into the cloaca, and sometimes protrude slightly at the surface at an acute angle (nearly tangent) to it.

Associated with the protrusion of these diacts into the cloaca are protoplasmic auxilliaries so that there are cloacal trabeculae. These have hitherto been associated with the solitary species of *Sycandra*, its genotype; this was originally described by Schmidt (1870, p. 74), as *Ute utriculus*, and is recorded from Greenland and the North Atlantic. Many other sponges were temporarily supposed to be in the genus *Sycandra*, chiefly by Haeckel, but have been removed to the correct genera, chiefly by Dendy and Row.

One must keep in mind the possibility that the present specimen may be a juvenile *Sycandra utriculus*, but data to that effect are wanting as yet. The specimen collected by Captain Bartlett lacks the gastral tetraxons of *utriculus*, and has diactines much smaller than those (12 by 1500μ) of *utriculus*.

Scypha lingua (Haeckel)

This species was described as *Sycortis lingua* by Haeckel (1872, p. 278) from Newfoundland. The sponge described by Haeckel (1872, p. 353)

as *Sycandra arctica* var. *polaris*, which was elevated to specific rank by Dendy and Row (1913, p. 747) is synonymous with *Scypha lingua*. Captain Bartlett dredged this species from a depth of 25–31 fathoms in Fox Basin, August 26, 1927.

It is notable that another member of the genus *Scypha* has been recorded from western Greenland; this was described as *Sycon karajakense* by Breitfuss (1898, p. 207) but differs strikingly from *lingua* in having small strongyles on the distal tufts where *lingua* has long oxeas.

Sycetta sagitta, n. sp.

The holotype (U.S.N.M. no. 22695) was collected at the west end of White Island, Frozen Strait, Fox Channel, August 10, 1933. It is ovoid, subcylindrical, of typical sycon-type architecture. It is 18 mm high and 4.5 mm in diameter where it is thickest. The consistency is softly fragile and the color is a pale yellow. The surface is nearly smooth, devoid of terminal tufts for the flagellate chambers. The terminal oscule is barely 300μ in diameter, and the cloaca scarcely wider. The flagellate chambers are about 120μ in diameter and 450μ long.

The principal spicules are pronouncedly sagittal triactines, some actually T-shaped. The shorter (paired) rays are about 4 by 100μ and the basal (unpaired) rays about 5 by 300μ. The gastral spicules are sagittal as usual, with the apical ray (projecting into the cloaca) somewhat bent. By very careful search two gastral tetractines (or quadriradiates) were found and one freakish pentactine. This is clearly very close to *Sycetta sagittifera* Haeckel (1872, p. 240), from Ceylon, but there are several definite differences between the two species. The Ceylon species has flagellate chambers less packed together, and as a result looks lumpy from the surface, while *sagitta* is smooth. Haeckel records no tetractines at all. Some of his spicules have rays 6 by 800μ, whereas none of those in the Greenland specimen are nearly that large. As these two closely related species become better known, more differences between them may perhaps be discovered.

Leucettusa usa, n. sp. Fig. 1 D

The holotype (U.S.N.M. no. 22696) was collected in Fox Basin, at a depth of 25–31 fathoms, on August 26, 1927; two others were taken in the same haul, and a fourth was collected August 13, 1927, at 34–37 fathoms in Fox Basin, lat. 66° 46′ N., long. 79° 15′ W. This last is the largest of the four.

The shape is very irregularly subcylindrical, in one case wider than high. The sizes are 20 to 34 mm high, 10 to 22 mm wide. The consistency is quite spongy for a Calcisponge, and the color is white. The surface is smooth, with very small pores. The apical oscule is from 2 to 7 mm in diameter, varying directly with the diameter of the sponge, independent of the height. The ectosome has more spicule content, and less protoplasm; the endosome has less spicule content and more protoplasm.

The principal spicules are very large tetractines with angles and actines approximately equal but with one pair of opposite actines often somewhat crooked. The rays are often about 85 by 1,100μ.

There is a dermal layer of smaller radiates, rays about 30 by 450μ. Some of these are triactines, tangentially placed. Others are tetractines with three rays tangent and one ray hypodermal.

There are vast numbers of very distinctive microscleres. These are sometimes oxeas, but more often bent, even sharply bent. They may have two or more angular bends in their length. Some are strongylote. The size is usually about 3 by 100μ, but with some little variation.

This species is strongly corticate like the type of the genus *Leucettusa*, which was described as *Leucetta corticata* Haeckel (1872, p. 129) from the West Indies; in fact, except for spiculation this species and the one here described are practically identical and very different from all other members of the genus. Yet *corticata* has few (if any) proper tetractines and none of the peculiar microscleres. On the other hand, *Leucettusa dictyogaster* Row and Hozawa (1931, p. 751), from West Australia, has spicules nearly exactly like those of *usa*, although its microscleres are twice as thick as those in the Greenland sponge. Furthermore, the Australian species is scarcely corticate at all, and has a very peculiar habitus of anastomosing tubes.

Leucosolenia macleayi (Lendenfeld)

This species was described as *Ascetta macleayi* by Lendenfeld (1885, p. 1086) from Australia, but it was soon found to be abundant and cosmopolitan. Captain Bartlett's specimen came from 20–30 fathoms near the entrance to Fury and Hecla Straits on September 3, 1933.

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ZOOLOGY.—Sinocybe, *a new genus of colobognath millipeds from China.*[1]

H. F. Loomis, Bureau of Plant Industry.

The milliped order Colobognatha is considered more primitive than any of the other orders of Chilognatha, as its mouthparts are of simplified form, adapted to sucking, instead of being developed into the more complicated mechanisms required for chewing foods. Parallel, but not necessarily simultaneous, evolution of structures is indicated by the fact that in this order legs 9 and 10 of the males have been modified for sexual purposes, whereas in other orders having these structures, termed "gonopods," at the anterior end of the body, legs 8 and 9 are modified. The gonopods of Colobognatha have not been changed to the extent found in the other orders, where the variations of structure offer many of the best taxonomic characters. There are other structural features in this order also which give evidence of closer association with prehistoric forms.

Geographic distribution of the order is another measure of its antiquity, for, while the members are found in all of the continents and many adjacent islands, relatively few genera and species are involved and, because of this and their diversity, these are looked upon as somewhat disconnected remnants of a much more populous fauna in past eras.

At the present time the Central American tropics and Malaysia vie for the lead in number of known species, although the United States is not far behind and has a diversity of forms surpassing all other countries.

One of the most typical of the Central American families of millipeds, although a small one, is the Platydesmidae of the present order. As the name implies, its species are very broad, with great development of the lateral carinae, and the legs are separated by broad sterna. This family is not known in the United States but is replaced by the Andrognathidae, containing some species resembling the platydesmids, in development of carinae, while others do not, being more slender, although to both forms narrow sterna are common. The superficial resemblance of the broad forms of these two families, which have quite similar gonopods, has caused many diplopodists to recognize only a single family. There are no more fundamental differences, however, between related families than the narrow sterna of the Andrognathidae, supporting a fungiform process separating the legs, and the very wide, simple sterna of the Platydesmidae lacking any counterpart of that process.

The Malayan genus *Pseudodesmus*, long referred to the latter family, has very narrow sterna, but whether a fungiform process is present is not known, although the narrow sterna alone are sufficient grounds for removing the genus from the Platydesmidae and locating it near or in the Andrognathidae, the latter course being followed here.

The discovery, 23 years ago, of a new generic member of the Andrognathidae in the Lu Mountains, Kiangsi Province, China, provides a connecting link, both geographically and structurally, between *Pseudodesmus* and the North American *Brachycybe*. The new genus is represented by two specimens, a male and nearly mature female, collected by O. F. Cook and the writer near Kuling, not far from the site where many specimens of an extremely bizarre milliped, later made the type of a new and archaic family of the order Merocheta,[2] were found. The presence of *Sinocybe*, as the new genus is to be named, lends further support to the view that the Lu Mountains contain a residual but superficially known milliped fauna of great age.

Sinocybe, new genus

Type: *Sinocybe cooki*, new species, from central China.

Diagnosis.—*Sinocybe* occupies a place almost intermediately between the North American *Brachycybe* and the Malayan *Pseudodesmus*. As compared to *Pseudodesmus* the body is smaller;

[1] Received April 22, 1942.

[2] Cook, O. F., and H. F. Loomis. *A new family of spined millipeds from central China.* Journ. Washington Acad. Sci. 14 (5): 103–108. 1924.

relatively broader; less convex; with fewer segments; surface less strikingly sculptured, although having two transverse series of tubercles instead of one; the preanal scale is in a special excision of the last segment, rather than excluded from it as shown in Pocock's illustration of *Pseudodesmus verrucosus*.[3] *Sinocybe* differs from *Brachycybe* in being much more convex; dorsal sculpture more strongly developed, especially on the anterior segments; head much flatter and thinner and with a raised margining rim on each side above the antenna; first segment strongly deflexed, thick, without expanded and projecting carinae and only slightly wider than the head.

Description.—Body close-jointed, the size and shape almost the same as the Californian *Brachycybe rosea* Murray, but the dorsal arch much higher (Fig. 1, B), with the head and anterior segments sloping or deflexed (Fig. 1, A), while in *Brachycybe* the anterior segments are horizontal.

Head turned underneath the first segment so that the vertex does not project beyond the first segment when viewed from above (Fig. 1, C), subcordate in outline when viewed from in front; in profile very thinly lenticular; raised marginal rim present above each antenna, surface pubescent along the posterior margin, elsewhere glabrous and very minutely punctate; antennae rising from the sides of the head, rather robust and compact, none of the joints notably elongate or crassate; gnathochilarium as in *Brachycybe*.

First segment facing forward, vertical to the body; rather small and thick as in *Pseudodesmus* and like it in being without produced carinae or expanded margins; surface finely and densely pubescent, with several large, elongate tubercles, but without a series of smaller tubercles as on the other segments.

Following anterior segments with lateral carinae produced forward as in *Brachycybe*, but with the posterior margin overlapped by the carinae of the next segment (Fig. 1, C); in *Pseudodesmus* the carinae are more strongly produced forward, the outer limits narrowed, subacute, whereas in *Sinocybe* they are broadly rounded, subtruncate; second segment with carinae much thicker than any others, the dorsum strongly arched and the transverse crest beset with tubercles in a single series; segments 3 and 4 with the crest reduced but bearing a single series of tubercles; subsequent segments with two rows of tubercles, dorsum with a strongly impressed median sulcus and a less definite transverse depression between the rows of tubercles; surface above and below pubescent; lateral carinae projecting outward as in *Brachycybe*, the pore in the margin, near the posterior corner (Fig. 1, D).

Posterior segments of the same general pattern as in *Brachycybe;* the penultimate segment with the two rows of tubercles scarcely reduced in size.

Last segment not tuberculate above; pubescent on the sides only; apical margin with six small teeth; ventral margin deeply excised and completely enclosing the moderately sized and nearly semicircular preanal scale on the sides and in front (Fig. 1, E); a shallower, less apparent excision is present in *Brachycybe* but in *Pseudodesmus*, as shown in Pocock's illustration (*loc. cit.*), the scale does not indent the margin of the last segment in the least.

Legs scarcely attaining the sides of the body; coxae narrowly separated; each sternum with a small anterior median lobe projecting slightly forward between the coxae of the preceding legs; each coxa with an inflated sack arising from an apical perforation.

Gonopods rather small and compact, resembling partially atrophied legs, as in *Brachycybe*.

Sinocybe cooki, new species

A mature male and a nearly mature female collected at Kuling, Kiangsi Province, China, October 17, 1919, by O. F. Cook and H. F. Loomis. Male type in the U. S. National Museum; female paratype in Museum of Comparative Zoology, Cambridge, Mass.

Description.—Body of the type 18 mm long and 3 mm wide, composed of 55 segments; similar in outline to *Brachycybe rosea* Murray but body arch much higher.

Head bent obliquely under body; cordate in front view, thinly lenticular in profile; surface finely pubescent along posterior margin, elsewhere glabrous, shining and very minutely punctate; margins of head, above antenna sockets, with a fine raised rim reaching half way to the middle of the posterior margin; antennae

[3] Ann. Mag. Nat. Hist. (ser. 5) **20**: pl. 14, fig. 3. 1887.

at sides of head; moderately robust; joints 1, 3, 4, and 5 subequal, about as broad as long, slightly exceeded by joints 2 and 6, the latter somewhat broader than the other joints.

First segment almost vertical, at a right angle to the long axis of the body; size small, scarcely wider than the head; thick and without expanded or projecting margins; median surface strongly impressed longitudinally, the surface on either side of the middle with three large, crest-like tubercles; one near the front corner directed obliquely backward and outward; anbrous above but not below; last few segments with dorsum much less pubescent between the large submedian tubercles than elsewhere.

Second segment with forwardly produced lateral carinae much thicker than the other carinae; dorsum strongly arched, transversely elevated into a broad, indefinite ridgelike prominence or crest bearing a series of 10 to 12 rounded tubercles of which the inner one on each side is the largest; next two segments crossed by decreasingly elevated tuberculate crests; segments thereafter with two series of

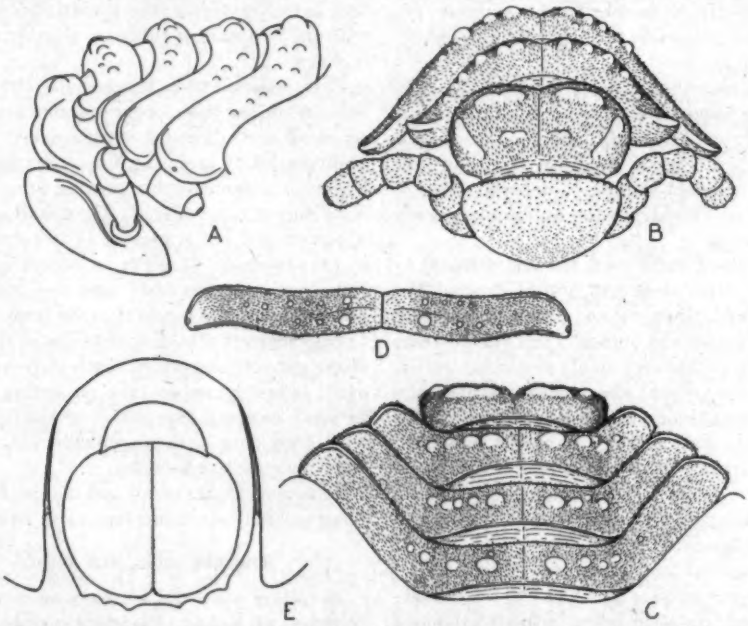

Fig. 1.—*Sinocybe cooki*, new species: A, Head and first five segments, lateral view; B, head and first three segments, anterior view; C, anterior end of body showing first four segments, dorsal view; D, segment from middle of body, dorsal view; E, last segment, anal valves and preanal scale, ventral view.

other of equal size close to the posterior margin and paralleling it; the third tubercle less than half as large as the others, transverse, slightly in front of the middle of the segment and rather close to the median impression; surface of segment with dense, subappressed pubescence but the tubercles smooth and shining; other segments with pubescence similarly disposed except that a small area near the pore is glabrous, and on the posterior segments the pubescence recedes from the lateral carinae and the last half dozen carinae are almost completely glatubercles separated by a depression extending half way to the lateral margin; anterior series of tubercles extending farther laterad and containing 12 to 18 tubercles decreasing in size from the large median pair; posterior series with 6 to 8 tubercles, the median pair of both series largest; on the anterior segments the inner pair of tubercles rather close together but wide apart on the posterior segments; lateral carinae declined from the dorsum with the outer portion becoming almost horizontal; outer margin short, the anterior corner broadly

rounded, the posterior corner slightly produced caudad; pore opening outward from the margin near the posterior corner; carinae of the anterior segments overlapped behind by the carinae of the next segment; margins of the outer half of the carinae raised above the inner surface but gradually lowered after the first few segments.

Penultimate segment with lateral carinae produced straight back, widely separated; the inner margins parallel, smooth; the outer margins, and those of several preceding segments, finely serrate.

Last segment longer than broad, the dorsum longer than on any other segment; surface smooth and glabrous except on the sides which are slightly pubescent; apex broadly rounded and with six small, subapical, marginal teeth or tubercles; ventral margin with a deep, semicircular excision which completely surrounds the preanal scale on the sides and in front.

Preanal scale almost a semicircle, crescentic, the posterior margin lightly emarginate, continuing the line of the margin of the last segment around the anal valves.

Valves strongly inflated, together almost hemispherical, the margins meeting in a groove.

Legs close together, the narrow sterna with anterior lobes projecting up and forward between the coxae of the preceding legs; coxae each with an inflated sack projecting from an apical perforation; tip of legs just attaining the sides of the body.

Gonopods closely resembling those of *Brachycybe*, being short, rather stout, curved forward and inward, and with easily distinguished leglike joints.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

THE ACADEMY

374TH MEETING OF THE BOARD OF MANAGERS

The 374th meeting of the Board of Managers was held in the library of the Cosmos Club on March 16, 1942. President CURTIS called the meeting to order at 8:01 P.M., with 23 persons present, as follows: H. L. CURTIS, F. D. ROSSINI, H. S. RAPPLEYE, N. R SMITH, R. J. SEEGER, F. H. H. ROBERTS, JR., F. G. BRICKWEDDE, H. B. COLLINS, JR., F. C. KRACEK, W. G. BROMBACHER, F. M. SETZLER, H. L. HALLER, A. H. CLARK, A. WETMORE, J. E. MCMURTREY, JR., W. A. DAYTON, F. B. SILSBEE, E. W. PRICE, L. W. PARR, H. G. DORSEY, H. STABLER, and, by invitation, G. A. COOPER and J. R. SWALLEN.

The minutes of the 373d meeting were read and approved. President CURTIS announced the following appointments:

Committee to consider certain questions relating to the membership: H. B. COLLINS, JR. (chairman), and E. W. PRICE.

Committee to consider the petition for affiliation of the District of Columbia Society of Medical Technologists: L. W. PARR (chairman), F. H. H. ROBERTS, JR., and A. H. CLARK.

Committee to consider ways and means of increasing the income of the Academy: W. A. DAYTON (chairman), H. S. RAPPLEYE, and F. B. SILSBEE.

For the Committee on Membership, Chairman KRACEK presented nominations for 6 persons (4 resident and 2 nonresident).

Three persons, one each from Canada, Mexico, and Argentina, were considered individually and duly elected to honorary membership.

For the Committee to consider certain questions relating to membership, Chairman COLLINS presented a report recommending (*a*) that three members of the Committee on Membership be reappointed each year in order to increase the degree of continuity in that Committee, (*b*) that more honorary members from South America be considered, and (*c*) that the number of honorary members be limited by the present Board to 25. The Board approved these recommendations.

For the Committee to consider the petition for affiliation of the District of Columbia Society of Medical Technologists, Chairman PARR presented a report recommending that this petition be declined. The Board approved this recommendation.

For the Committee to consider ways and means of increasing the income of the Academy, Chairman DAYTON presented a report recommending (*a*) that the number of active resident members be increased from 450 to 600, (*b*) that the membership of the Academy be canvassed regarding the matter of increasing dues from $5 to $6 annually, (*c*) that a Committee be appointed to obtain patrons for the Academy, and (*d*) that the JOURNAL of the Academy consider the placing therein of appropriate paid advertising. The Committee also reported that 33 State Academies of Science affiliated with the American Association for the Advancement of Science were being circularized with an appropriate questionnaire. The Board acted separately on each of the foregoing recommendations, as follows: (*a*) It was decided

to submit to the membership for their approval a proposed amendment to the bylaws increasing the permissible number of resident members from 450 to 500; (*b*) it was decided not to consider increasing the membership dues; (*c*) the President was authorized to appoint a Committee on patrons for the Academy; (*d*) the question of obtaining income by selling advertising space in the JOURNAL was referred to the Board of Editors. The Committee was thanked for the work accomplished.

The Secretary reported the following data relating to the membership: Acceptances, 2; qualified, 1; retirements, 1; status of membership as of March 16, 1942:

	Regular	*Retired*	*Honorary*	*Patrons*	*Total*
Resident	433	36	3	0	472
Nonresident	129	19	13	2	163
Total	562	55	16	2	635

The Secretary reported as follows on the "List of Officers for 1942 of the Washington Academy of Sciences and its Twenty Affiliated Societies": 1500 copies of a 4-page booklet, without cover, under the foregoing title, were published under date of February 9, 1942, with mailing actually being made on February 21, 1942. The cost was as follows: Editorial services, $10; printing, $20.20; total, $30.20. Since a total of $60 was allotted for the job, a balance of $29.80 remains in the treasury.

Archivist SMITH reported that he had opened the sealed package relating to the selection of the original membership of the Academy by the Joint Commission of the Scientific Societies of Washington and found nothing in it of particular interest. Only one ballot carried any notation beyond that of the marks for balloting.

On recommendation of the Board of Editors, it was moved and carried that (*a*) the operational increase of 6 per cent proposed by the George Banta Publishing Co. as a surcharge effective with the issue of April 15, 1942, be approved; (*b*) the practice of giving free to authors 50 reprints without covers be discontinued after the March 15, 1942, issue; (*c*) the Executive Committee be authorized to reconsider, in consultation with the Board of Editors of the JOURNAL, the 1942 budget allotment for the JOURNAL.

Following a statement by the Secretary that the bylaws were in need of revision on several noncontroversial points, it was moved and carried that the President appoint a Committee to consider proposed amendments to the bylaws.

Following some considerable discussion, it was moved and carried that the President appoint a Committee to consider ways and means of decreasing the operating expenses of the Academy without decreasing the services performed.

311TH MEETING OF THE ACADEMY

The 311th meeting of the Academy was held in the assembly hall of the Cosmos Club at 8:15 P.M. on March 19, 1942, with President CURTIS presiding.

The meeting was devoted to the presentation by the Academy of its Awards for Scientific Achievement for 1941, as follors:

For the Biological Sciences, to G. ARTHUR COOPER, U. S. National Museum, in recognition of his distinguished service in the field of invertebrate paleontology, notably for the discovery of anatomical structures hitherto unknown.

For the Engineering Sciences, to THEODORE R. GILLILAND, National Bureau of Standards, in recognition of his distinguished service in originating automatic ionosphere recordings for continuously variable radio frequencies.

For the Physical Sciences, to STERLING B. HENDRICKS, U. S. Bureau of Plant Industry, in recognition of his distinguished service in determining the constitution of micaceous and other complex minerals.

The recipients were introduced by ALEXANDER WETMORE, HERBERT GROVE DORSEY, and FRANCIS O. RICE, respectively, and gave brief addresses concerning the work for which they were given the awards.

There were about 70 persons present. A social hour followed the meeting.

312TH MEETING OF THE ACADEMY

The 312th meeting of the Academy was held in the assembly hall of the Cosmos Club at 8:15 P.M. on April 16, 1942, with President CURTIS presiding.

PAUL R. HEYL, chief of the section on sound at the National Bureau of Standards, delivered an address entitled *Cosmic emotion*, published in the August, 1942, issue of this JOURNAL.

There were about 110 persons present. A social hour followed the meeting.

375TH MEETING OF THE BOARD OF MANAGERS

The 375th meeting of the Board of Managers was held in the library of the Cosmos Club on May 18, 1942. President CURTIS called the meeting to order at 8:01 P.M., with 18 persons present, as follows: H. L. CURTIS, F. D. ROSSINI, N. R. SMITH, W. W. DIEHL, R. J. SEEGER, J. E. GRAF, F. H. H. ROBERTS, JR., H. B. COLLINS, JR., F. C. KRACEK, W. G. BROMBACHER, F. M. SETZLER, J. B. REESIDE, JR., F. B. SILSBEE, E. W. PRICE, C. L. GARNER, and, by invitation, G. A. COOPER, J. R. SWALLEN and C. E. CHAMBLISS.

The minutes of the 374th meeting were read and approved. President CURTIS announced the following appointments:

Committee on patrons for the Academy: C. E. CHAMBLISS (chairman) H. C. FULLER, C. L. GARNER, and J. W. MCBURNEY.

Committee to consider proposed amendments to the bylaws: F. B. SILSBEE (chairman), N. R. SMITH, and F. D. ROSSINI.

Committee to consider ways and means of decreasing the operating expenses of the Academy: F. G. BRICKWEDDE (chairman), E. W. PRICE, and H. STABLER.

For the Executive Committee, President CURTIS reported that this Committee had held a meeting just preceding the meeting of the Board, had received written and oral reports from the Board of Editors regarding the needs of the JOURNAL for more funds in order to publish as much or slightly more material in 1942 than in 1941, had received through the Secretary an oral report from the Treasurer that the Academy would probably just balance its budget for 1942 with the present allotments, and had unanimously agreed to recommend to the Board that no change be made in the allotment to the JOURNAL for 1942. The Committee felt that any funds available for the JOURNAL should be conserved for the next year, when its needs for assistance would certainly be greater.

For the Committee on Meetings, Chairman GARNER presented a summary report on the activities and budget of his Committee for the past 12 months. He reported that the Academy had held 7 meetings from October, 1941, through April, 1942, at an average cost of $40.56 per meeting. This was slightly less than normal because, for the October, 1941, meeting, half of the expenses were paid by the Washington Society of Engineers. Under the present plans, each meeting of the Academy normally costs about $45, which includes, on the average, $20 for the rental of the assembly hall, $9 for the lantern operator, $3 for dinners for the Speakers, and $13 for the buffet luncheon. It was recommended that consideration be given to obtaining as many out-of-town speakers as possible. Of the $300 allotted to the Committee on Meetings for 1942, $194.13 has been expended, leaving $105.87 for the three meetings from October through December. The apparent excess of the pro-rata amount for the first four meetings of 1942 arose from the fact that commitments for the first three meetings were made on the basis of the 1941 budget before the allotment for 1942 was announced.

It was moved and carried that Chairman GARNER and his Committee be commended for their good work.

For the Committee on Membership, Chairman KRACEK presented nominations for 17 persons (13 resident and 4 nonresident).

Six persons (4 resident and 2 nonresident), whose nominations had been presented on March 16, were considered individually and duly elected to membership.

For the Committee to consider proposed amendments to the bylaws, Chairman SILSBEE presented a report recommending five amendments, as follows:

(*a*) In Article I, Section 2, second sentence, after the word "retired" insert: "from the active practice of their profession."

(*b*) In Article I, Section 2, paragraph 1, add the sentence: "Persons who have been dropped from membership for nonpayment of dues may be reinstated upon approval of the Board of Managers and upon payment of back dues for two years, together with the dues for the year of reinstatement."

(*c*) In Article III, Section 5, delete the sentence "Associate Editors shall be appointed by the President for a term of three years." (This sentence properly belongs in the Standing Rules of the Board.)

(*d*) In Article IV, Section 1, third sentence, delete the first "and," and after "publications" insert "and Committee of Tellers." In Article VI, Section 1, change the last paragraph to read: "The Committee of Tellers shall canvass the votes and report the results at the annual meeting of the Academy." (This change would permit the Committee of Tellers to read their own report at the annual meeting, instead of transmitting it to the Secretary.)

(*e*) In Article VI, Section 1, fourth paragraph, last sentence, change "second Tuesday" to "first Thursday." (This change would give the Committee of Tellers always two weeks in which to count the ballots. Under the existing rule, the time may be as short as one day.)

The Board voted to submit these proposed amendments, with the word "gainful" in place of "active" in part (*a*), to the membership for approval.

The Secretary reported the following data relating to the membership: Acceptances, 2; qualified, 1; deaths, 3; retirements, 1; resignations, 3; status of membership as of May 18, 1942:

	Regular	*Retired*	*Honorary*	*Patrons*	*Total*
Resident	432	35	3	0	470
Nonresident	130	18	15	2	165
Total	562	53	18	2	635

Archivist SMITH reported the addition to the Archives of an important document, entitled "Royal Society (of London), Charter-Book Signatures, 1660–1912."

On recommendation of the Board of Editors, the Board approved the following regulation relating to illustrations in the JOURNAL, as of May 15: "Illustrations in excess of the equivalent (in cost) of one page and a half of line drawings shall be paid for by the author."

The Secretary read a letter received from the office of the American Association for the Advancement of Science informing the Academy of its election as an affiliated member of the A.A.A.S. on the same basis as affiliated State academies of science. Each affiliated Academy may appoint one representative on the Council of the A.A.A.S., and two honorary junior

members, one boy and one girl, to the Association. The Association provides a research grant to each Affiliated Academy in the amount, each year, of 50 cents for each member of the Academy who is also a member of the A.A.A.S.

The Secretary read a letter from WALDO L. SCHMITT, resident member of the Academy, recommending that the Academy carry on a drive for increased subscriptions to the JOURNAL in Central and South America by extending one year's free subscription to a number of selected institutions and by widely distributing copies of the contents of the JOURNAL in those countries.

The letter was referred to the Custodian and Subscription Manager of Publications for appropriate reply.

Adjournment was made at 10:04 P.M.

376TH MEETING OF THE BOARD OF MANAGERS

The 376th meeting of the Board of Managers was held in the library of the Cosmos Club on June 8, 1942. President CURTIS called the meeting to order at 8:02 P.M., with 13 persons present, as follows: H. L. CURTIS, F. D. ROSSINI, N. R. SMITH, R. J. SEEGER, F. H. H. ROBERTS, JR., H. B. COLLINS, JR., F. C. KRACEK, A. H. CLARK, W. A. DAYTON, L. W. PARR, and, by invitation, G. A. COOPER, J. R. SWALLEN, and J. H. KEMPTON.

The minutes of the 375th meeting were read and approved.

President CURTIS announced the following appointment: A. H. CLARK to be the Academy's representative for 1942 on the Council of the American Association for the Advancement of Science.

For the Committee on Meetings, Chairman KEMPTON reported that STUART MUDD, of the University of Pennsylvania, would address the October meeting of the Academy on the subject *Bacteria and the electron microscope*. He also reported that there appeared to be insufficient funds remaining to carry the normal program of meetings for October, November, and December.

Fifteen persons (13 resident and 2 nonresident), whose nominations were presented on May 18, 1942, were considered individually and duly elected to membership.

For the Committee to consider ways and means of increasing the income of the Academy, Chairman DAYTON presented a report giving in detail the results of the questionnaire sent out to each of 33 State Academies of Science affiliated with the American Association for the Advancement of Science, from whom replies were received from all but two. Chairman DAYTON was complimented on the excellent work of his Committee and was instructed to prepare a summary of his report for distribution to the members of the Board of Managers through the office of the Secretary.

The Secretary presented the following data relating to membership: Acceptances, 4; deaths, 1.

Adjournment was made at 9:24 P.M.

NEW MEMBERS

The following persons were recently elected members of the Academy:

Resident

TAISIA MAXIMOVNA STADNICHENKO, associate geologist, U. S. Geological Survey, in recognition of her microscopic and microthermal studies of coal.

LEO OTIS COLBERT, director of the U. S. Coast and Geodetic Survey, Rear Admiral, in recognition of his leadership in the advancement of the science and art of cartography.

FLOYD SHELTON DAFT, senior biochemist, National Institute of Health, in recognition of his work in biochemistry, particularly his researches with vitamins of the B complex.

HENRY MILES O'BRYAN, associate professor of physics, Georgetown University, in recognition of his contributions to physics, particularly his researches on the solid state.

MERRITT NICHOL POPE, agronomist, U. S. Bureau of Plant Industry, in recognition of his studies on the physiology, morphology, and genetics of barley.

MARY ELIZABETH REID, cytologist, National Institute of Health, in recognition of her contributions in the field of nutrition in relation to growth and development.

STEPHEN BRUNAUER, associate chemist, U. S. Bureau of Plant Industry, in recognition of his researches in the surface layers of adsorbed gases on catalytic and other materials, which have made clear the atomic and molecular characters of various gases when adsorbed on various materials and which have thrown light on the reasons for the catalytic action of promoters in catalysis.

MARY EUGENIE MAVER, senior biochemist, National Cancer Institute, in recognition of her outstanding research on the isolation and purification of physiologically active proteins, such as diphtheria toxins and the proteinase of cellular tissues.

EVELYN BUTLER TILDEN, bacteriologist, National Institute of Health, in recognition of her studies on Protozoa, Oroya fever, trachoma and spirochetal diseases, and the preparation of new and rare sugars by bacterial oxidation, and of a new type of amylase.

CHARLES EDWARD WHITE, professor of inorganic chemistry, University of Maryland, in recognition of his work on fluorescence, particularly as a means of quantitative inorganic microanalysis.

WILLIAM DONALD URRY, physical chemist, Geophysical Laboratory, Carnegie Institution of Washington, in recognition of his work on

natural radioactivity, particularly as applied to problems in geophysics.

LEE MILO HUTCHINS, head of the division of forest pathology, U. S. Bureau of Plant Industry, in recognition of his work on virus diseases of tree fruits, particularly the technique of studying virus diseases of woody plants.

RALPH WILLARD IMLAY, geologist, U. S. Geological Survey, in recognition of his work on the Mesozoic geology of Mexico and the Gulf region of the United States.

KARL HILDING BEIJ, hydraulic engineer, National Bureau of Standards, in recognition of his investigations in connection with aircraft instruments, corrosion and physical properties of copper, and hydraulics.

GEORGE GORHAM DEBORD, bacteriologist, District of Columbia Health Department, in recognition of his work in food and medical bacteriology.

JOSEPH JOHN FAHEY, geochemist, U. S. Geological Survey, in recognition of his meritorious work in geochemistry and mineralogy.

ERNEST FRANKLIN FIOCK, senior physicist, National Bureau of Standards, in recognition of his meritorious work in the field of calorimetry and for revealing studies of combustion processes.

GLENN ARTHUR GREATHOUSE, physiologist, U. S. Bureau of Plant Industry, in recognition of his work on the chemistry of disease resistance in plants.

FOREST KLAIRE HARRIS, associate physicist, National Bureau of Standards, in recognition of his work in the field of precise electrical measurements.

GARGIS HOVENNES KEULEGAN, physicist, National Bureau of Standards, in recognition of his mathematical and experimental investigations in the fields of elasticity and hydrodynamics.

ROBERT M. SALTER, chief, U. S. Bureau of Plant Industry, in recognition of his work in soil fertility, especially fertilizer application and the influence of soil reaction on efficiency of soil and fertilizer phosphorus.

Nonresident

DOW V. BAXTER, associate professor of silvics and forest pathology, School of Forestry, University of Michigan, in recognition of his contributions to forest pathology, particularly his researches on the genus *Poria*.

VILHJALMUR STEFANSSON, explorer, in recognition of his outstanding contributions to our knowledge of the history, geography, and ethnology of the Arctic.

ROBERT RAYNOLDS MCMATH, director of the McMath-Hurlburt Observatory, University of Michigan, Pontiac, Mich., in recognition of his contributions to the science of astronomy in general and to our knowledge of solar prominences in particular.

CHESTER STOCK, professor of paleontology, California Institute of Technology, Pasadena, Calif., research associate of the Carnegie Institution of Washington, and curator of paleontology, Los Angeles Museum, Los Angeles, Calif., in recognition of his contributions to vertebrate paleontology, particularly the Tertiary and Pleistocene vertebrates of Western United States.

WILLIAM HAY TALIAFERRO, dean of the division of biological sciences and professor and head of the department of bacteriology and parasitology, University of Chicago, Chicago, Ill., in recognition of his distinguished leadership in the field of parasitology, with particular reference to the cytology, physiology, and immunology of the parasitic Protozoa and to notions regarding the cellular basis of immunology in general.

Honorary

ALFONSO CASO, director of the National Institute of Anthropology and History, Department of Public Education, Mexico, in recognition of his contributions to archeology, particularly his excavations at Monte Alban and his direction of the anthropological work of the Government of Mexico.

DIAMOND JENNESS, chief of the division of anthropology, National Museum of Canada, Ottawa, Canada, in recognition of his contributions to the ethnology, archeology, and anthropology of the Canadian aborigines, both Eskimo and Indian.

ALFREDO SORDELLI, director of the Institute of Bacteriology, Buenos Aires, Argentina, in recognition of his work in research on anaerobic antitoxins and their standardization.

GEOLOGICAL SOCIETY

590TH MEETING

The 590th meeting of the Society was held at the Cosmos Club, January 8, 1941, President J. B. REESIDE, JR., presiding.

Program—H. D. MISER: *The Devonian system in Arkansas and Oklahoma.* An unusual variety of flint of Devonian age known as novaculite, much of which in appearance resembles white marble, is widespread in the Ouachita Mountains of Arkansas and Oklahoma. This rock was used by the early American Indians for making stone implements, and their many long-abandoned quarries, some of which are on Indian Mountain near the Hot Springs National Park, may still be visited. By modern man the novaculite is used for making oilstones, which are marketed in the United States and other countries.

Petrified logs of trees that lived 300,000,000 years ago in the Devonian period are found in the Woodford chert in the Arbuckle Mountains of Oklahoma. One of the tree trunks, which is the largest known petrified log of so great an age, has been transported to the campus of the East Central Oklahoma State Teachers College at Ada, Okla., where it has been erected by John Fitts as a monument to the memory of the late David White, one of the world's distinguished geologists.

Commercial petroleum has been produced from porous limestone of Devonian age in the greater Seminole and other fields in central Oklahoma for almost 20 years. This limestone is commonly referred to as the Hunton. Oil is also obtained in many areas in Oklahoma from the Misener sand, apparently a dune sand of Devonian or Mississippian age.

R. C. WELLS: *The relative abundance of nickel in the earth's crust.* Figures for the percentage of nickel in different classes of rocks were given showing that nickel is found mainly in magnesian rocks, especially in nickeliferous olivine, in pyroxenite, in peridotite, and in dunite. Based on the proportions of ocean and different kinds of rocks in the 10-mile crust the average nickel content was estimated to be 0.016 percent, a slightly lower figure than most previous estimates.

T. L. KESLER: *Genetic history of the pegmatites and associated rocks of the Carolina tin belt.* A belt of the Piedmont province in southern North Carolina, extending 24.5 miles from Lincolnton southwestward to Grover, contains hundreds of pegmatite bodies characterized by the presence of cassiterite and spodumene. The pegmatite bodies are enclosed in muscovite schists and hornblende-biotite gneisses which, in the vicinity of the town of Kings Mountain, lie conformably between a very large and irregular granitic body to the west and interbedded crystalline limestone, quartzite, and muscovite schist to the east. The hornblende-biotite gneisses are strongly metamorphosed limestone; incompletely altered limestone shows the development of minerals characteristic of the hornblendic rocks. Triassic diabase dikes cut rocks of all other types.

Regional folding, which preceded or accompanied the metamorphism of the sedimentary rocks, set up strains that were compensated by recurrent flexing and jointing which provided channels for the introduction of successive waves of aqueous solutions that deposited the pegmatite minerals. In general, these minerals were deposited in prominent joints where the rocks are uniformly competent over broad areas, and parallel to strike and dip where competent and incompetent rocks are interbedded. The solutions also permeated considerable muscovite schist adjacent to the channels, and the schist was partly replaced by pegmatite minerals, particularly quartz, albite, and microcline. The greisen of the tin belt, which commonly contains cassiterite, is muscovite schist partly replaced by quartz, with residual muscovite coarsened by recrystallization.

The pegmatite bodies contain at least 25 hypogene minerals, 5 derived from the wall rocks, and 7 or more formed by weathering. Some of the hypogene minerals are rare, and many cannot be reliably placed in the sequence of deposition. Paragenetic relations are based largely on successive fracturing and consequent veining of earlier by later minerals. Deposition of the commoner types occurred in the following stages, beginning with the earliest: (1) tourmaline, beryl, and apatite; (2) cassiterite and columbite-tantalite; (3) quartz (greisen formed); (4) spodumene; (5) microcline; (6) medium-grained albite (minor alteration of spodumene and microcline to muscovite); (7) fine-grained albite and quartz (abundant, accompanied by minor quantities of sulphides and apatite).

591ST MEETING

The 591st meeting of the Society was held at the Cosmos Club, January 22, 1941, President J. B. REESIDE, JR., presiding.

Informal communications.—W. P. WOODRING reported the occurrence of marine Lower Miocene fossils in Cajon Pass, Calif., and discussed their paleogeographic significance.

Program.—J. BRIDGE: *Correlation of early Paleozoic sections in Texas.*

H. C. SPICER: *Resistivity studies in the potash area of New Mexico.* The results of some electrical resistivity studies were described that were made over the potash deposits near Carlsbad, N. M. The Gish-Rooney apparatus was used in the investigation and its application is briefly described. Geological features pertain-

ing to the area are briefly given. From the interpretations of the apparent resistivity curves, structural contours were determined on the tops of the Rustler and Salado formations, cross sections showing the depths to the formations were made, and the probable eastern boundary of salt water was located. An explanation is offered on the formation of the greatly depressed area found in the salt and in the Rustler formation near the western edge of the area studied. Some of the apparent resistivity curves are shown in conjunction with the logs of nearby drill holes.

G. W. STOSE: *Structural interpretation of the Death Valley region by Levi Noble.* Later pre-Cambrian, Cambrian, and Tertiary rocks have been thrust northwestward over earlier pre-Cambrian metamorphic rocks. The fault plane is called the Amargosa thrust. The thrust plate is broken into innumerable blocks and slices which form a complex mosaic and is named the Amargosa chaos. The chaos is divided into the Virgin Spring, Calico, and Jubilee phases, each characterized by certain kinds of rocks. Unconformably upon the overthrust chaos was deposited the Funeral formation, composed of fanglomerate and basaltic lava of late Pliocene age. These younger rocks are deformed by folds and normal faults, which also folded the Amargosa thrust into several plunging anticlines of northwest trend. The earlier pre-Cambrian rocks below the thrust are exposed by erosion on the crests of these anticlines. The folds in the late Pliocene fanglomerate and basalt are so recent that they are reflected in the present topography. Death Valley is primarily a syncline in the Funeral fanglomerate, modified by faulting.

592D MEETING

The 592d meeting of the Society was held at the Cosmos Club, February 12, 1941, President J. B. REESIDE, JR., presiding.

Informal communications.—F. L. HESS: *A silicified coral from Florida.*

Program.—F. G. CALKINS: *Curves for determining plagioclases.* Curves for determining the composition of plagioclases by the methods that have been found most useful are combined in a single convenient chart.

D. E. WHITE: *Antimony deposits of the Yellow Pine District, Idaho.*

R. W. CHAPMAN: *The Laurel "pseudomigmatite" and its significance in petrogenesis.* The Laurel pseudomigmatite lies in the vicinity of Laurel, Md., about 17 miles southwest of Baltimore. A cover of Cretaceous gravels obscures its areal extent, but it is at least 48 square miles. On the north the pseudomigmatite is bounded by Guilford granite and Wissahickon schist, on the northeast by gabbro, on the east by Cretaceous gravels, on the south by schist and gneiss, and on the west by the Wissahickon formation.

The pseudomigmatite is gray, medium to fine grained, and faintly foliated. Chief minerals are quartz, oligoclase, biotite, and muscovite. Remnants of Wissahickon schist and quartzite are common in it.

Although the pseudomigmatite looks like a true migmatite, it is believed to have originated by the granulation, flowage, and recrystallization of the Wissahickon formation under conditions of stress, high temperature, and abundant water. This is suggested by: (1) the close mineralogical and chemical similarity of the two rocks, (2) the granulated and recrystallized texture, (3) the abundance of Wissahickon schist and quartzite remnants which do not show granulation or recrystallization, and (4) the complete gradation from pesudomigmatite into Wissahickon schist across contacts.

The Laurel pseudomigmatite has most of the features of a plutonic igneous rock, but it does not show intrusive contacts. It is thought, however, that if conditions of metamorphism had been more intense it might have developed even these. This suggests that some rock bodies, which have all the characteristic features of true igneous rocks, may have actually originated by the recrystallization of older formations.

593D MEETING

The 593d meeting of the Society was held at the Cosmos Club, February 26, 1941, President J. B. REESIDE, JR., presiding.

Informal communications.—M. I. GOLDMAN discussed the presentation of scientific papers and urged that members of the Society refrain from reading prepared manuscripts; he then read extracts from recent numbers of *Science* on this subject.

Program.—M. M. KNECHTEL: *Influence of topography on continental glaciation in north-*

central Montana. Glacial striae on shonkinite exposures at Snake Butte, a prominent intrusive in the plains south of Harlem, Mont., trend southeastward. A train of shonkinite boulders, many of them enormous and some of them striated, extends southeastward 50 miles from Snake Butte across the plains of the Fort Belknap Indian Reservation. The ice of the Keewatin glacier is believed to have piled high against the north side of the Bearpaw Mountains, developing a southeastward gradient of its surface down the pre-glacial Missouri River valley, now occupied by Milk River. Thinning of the ice in this down-gradient direction offers an explanation for the southeastward movement of the Snake Butte boulders, as the rock debris in the mobile basal part of the ice sheet would presumably be transported in the directions of diminishing pressure toward the thinner marginal parts of the glacier.

Interrelations are suggested between southeastward-trending glacial, topographic, and bedrock features in the Fort Belknap Indian Reservation, where *roches moutonnées* and glacial rock basins are tentatively identified. The speaker adopts Calhoun's explanation of drainage changes brought about by the glacier in the vicinity of the Bearpaw and Little Rocky Mountains.

C. P. Ross and R. G. Yates: *Coso quicksilver district, Inyo County, Calif.* The hot springs in the Coso Range in the southwestern corner of Inyo County, Calif., have been known and utilized for their supposed medicinal value since about 1875. About 1929 the presence of cinnabar in some of the hot spring sinter deposits was recognized, but development and production so far have been small. At least two of the deposits are of interest as possible sources of large amounts of quicksilver under emergency conditions.

The Coso Range contains Jurassic (?) granitic rocks, in part covered by Pleistocene (?) rhyolitic and basaltic lava and pyroclastics. Faults furnished passageways for the lava and later for the hot spring water. Early in the hot-spring activy large quantities of opaline sinter were deposited from large volumes of alkaline solution. Later alkaline solutions of somewhat different composition left cinnabar in openings widely but irregularly distributed throughout the sinter. At present relatively small amounts of acid water and steam rise through the sinter.

D. G. Thompson: *Fluctuations of water levels in wells caused by distant earthquakes.*

594TH MEETING

The 594th meeting of the Society was held at the Cosmos Club, March 12, 1941, President J. B. Reeside, Jr., presiding.

Informal communications.—J. Bridge: *Dreikanter from Cambrian formations of the United States.*

Program.—W. E. Richmond: *Application of X-ray methods to mineral analysis.* X-ray diffraction powder photographs of analysed chromites from various localities give the unit cell-edge lengths. These cell-edge lengths increase with the chromium content for a given percentage of Fe_2O_3. These lengths plotted against chromium content give a uniform straight-line curve.

W. S. Burbank: *Spiral fracturing from volcanic centers.*

E. Cloos: *Deformation of oolites in relation to cleavage.*

595TH MEETING

The 595th meeting of the Society was held at the Cosmos Club, March 26, 1941, President J. B. Reeside, Jr., presiding.

Informal communications.—A. C. Spencer spoke in commendation of the paper by E. Cloos presented at the last meeting and referred to it as an epochal advance in studies of rock deformation. He described folded veinlets and ladder veins which also may be used to measure deformation.

M. I. Goldman discussed the origin of stylolites and pointed out that true stylolitic structures may in places signify a thinning of beds amounting to more than 20 per cent.

Program.—D. J. Cederstrom: *Progressive down-dip changes in composition in artesian waters from the Cretaceous rocks of Virginia.* Near the Fall Zone ground waters in the Cretaceous strata are soft, low in dissolved mineral content, and contain moderate amounts of carbon dioxide. Down the dip to the east the waters become hard, owing to solution of calcium carbonate. The free carbon dioxide in the waters in the Fall Zone enables the waters to take a maximum of 250 parts per million of bicarbonate (as calcium bicarbonate) into solution. About 20 to 30 miles east of the Fall

Zone the waters become soft as a result of base exchange. Eocene glauconite sand and clayey sediments in the Potomac section probably act as exchangers.

The difference between a maximum of 250 parts per million of bicarbonate due to the solvent action of free carbon dioxide on limy material and a maximum of 800 parts of bicarbonate found in some waters far down the dip has not been accounted for. Small amounts of free carbon dioxide in these waters appear to indicate that carbon dioxide is being liberated by some Coastal Plain sediments. There is considerable doubt that methane is capable of reducing sulphates, as suggested by Renick. Carbon dioxide and methane might be liberated and hydrogen sulphide produced by the reduction of sulphates through the agency of organic matter in the sediments. The entire problem, however, must be regarded as unsolved.

Waters containing more than a few parts per million of chloride are found only in eastern Nansemond County and Norfolk County. The brackishness of these waters is believed to be due to lack of flushing out of marine waters with which the sediments were once saturated.

Waters containing 1 to 6 parts per million of fluoride occur within the soft water zone. The origin of the fluoride is unknown but it is believed to be derived in large part from some normal constituent of the Potomac group.

P. S. SMITH: *Recent hydrographic surveys along the Atlantic Coast.*

R. F. FLINT: *Atlantic coastal terraces.* (Published in this JOURNAL **32** (8): 235–327. 1942.)

596TH MEETING

The 596th meeting of the Society was held at the Cosmos Club, April 9, 1941, President J. B. REESIDE, JR., presiding.

Informal communications.—W. B. LANG discussed the occurrence of langbeinite in this country and its production as a commercial source of potash.

M. W. ELLIS described a method of making casts and molds of fossils with a rubberlike substance soluble in ammoniacal water solution.

Program.—C. B. READ: *Sequence and relationships of late Paleozoic floras in the southwestern United States.*

W. P. WOODRING: *Ancient soil and ancient dune sand in the Santa Maria district, California.* Remnants of siliceous hardpan are widespread in the Santa Maria district. Though hardpan may have formed at different times, at least much of it antedates development of the present topographic surface and is considered part of an ancient soil of post-Pleistocene age, younger than terrace deposits assigned to the late Pleistocene. The hardpan is troublesome in geologic mapping. In extensive areas where bedrock consists of sand and gravel it is the hardest and most completely exposed material. Its attitude may bear any relation to the attitude of bedrock strata.

Dune sand, now fixed by vegetation, is thought to be younger than the ancient hardpan. On the south side of the Santa Maria Valley this inactive ancient dune sand extends from the coast to localities 20 miles inland, whereas modern dune sand is limited to a narrow coastal strip. The ancient dune sand is inferred to indicate a climatic change, either stronger winds or greater aridity than at present, more probably greater aridity.

E. P. HENDERSON: *A large weathered meteorite from the Coastal Plain of Georgia.* (Published in extended form in Proc. U. S. Nat. Mus. **92**: 141–150, 2 pls. 1942.)

597TH MEETING

The 597th meeting of the Society was held at the Cosmos Club, April 23, 1941, President J. B. REESIDE, JR., presiding.

Informal communications.—D. G. THOMPSON: *Sand coated with humous material from borders of depressions in Carolina Bay country.*

Program.—G. A. COOPER: *Facies relations of the Hamilton group along the Catskill front.*

F. C. KRACEK: *The ternary system gold-silver telluride.*

A. M. MORGAN: *The role of solution in the development of the Pecos River basin, N. Mex.*

598TH MEETING

The 598th meeting of the Society was held at the Cosmos Club, November 12, 1941, President J. B. REESIDE, JR., presiding.

Informal communications.—RALPH CANNON discussed systematic variation in fluorescence of members of scheelite-powellite series. Ranges from blue through white to yellow occur in powellite.

Program.—E. T. McKnight: *Zoning of ore deposits in the Tri-State district.* Examples of small scale zoning in peripheral parts of the Oklahoma–Kansas field were described and illustrated. The core of each zoned area is massive gray spar dolomite formed by replacement of the limestone; it commonly contains, near its center, introduced (cave filling) Cherokee shale and a high percentage of chert relative to the dolomite. Pink spar dolomite is a vug phase nearly coextensive with the gray spar but subordinate in total mass. Surrounding the dolomite is the sphalerite zone which tends to ring the gray spar core in a closed irregular but commonly oblong circuit. Some of the highest grade ore is found where the dolomite and sphalerite overlap on the inner edge of the sphalerite zone. Chalcopyrite and enargite are confined almost entirely to this area of overlap, though they may extend back a short distance in the dolomite. The galena zone overlaps the sphalerite zone but tends to lie just outside of it. Still farther out comes the barren "boulder ground" zone characterized by coarse marcasite and abundant calcite in loose bouldery chert that is residual from more or less complete removal by solution of the original limestone. Beyond this comes the unaltered limestone. Jasperoid replaces the limestone in all the outer zones up to the unaltered limestone but does not encroach very far on the dolomite core except on the inner side of the sphalerite zone where the gray spar dolomite is partly replaced. Removal of the ore along the combined sphalerite and galena zones leaves an asymmetric stope, characterized on the inner wall by massive gray spar with subordinate pink spar vugs that may contain some calcite, on the outer wall by open bouldery ground with jasperoid and abundant calcite. The zoned areas are commonly only a few hundred feet across. Numerous examples, more nearly circular in ground plan, are indicated in the Joplin area by the descriptions of Smith and Siebenthal.

D. Gallagher: *Granitization in Central Africa.*

Max Demorest: *Types of ice flow within glaciers.* Four "types of ice flow" that form a gradational series are recognized. Each type is characteristic of distinct glacial conditions of surface configuration and underlying topography. The types are called: (1) extrusion flow, (2) obstructed extrusion flow, (3) obstructed gravity flow, and (4) gravity flow.

The first two types occur only where the surface of a glacier is of gentle slope and where the glacier's floor is either nearly horizontal or sloping upward in downstream direction (ice sheets, piedmont glaciers, névé fields, and some valley glaciers). The stresses responsible for flow are differential pressures resulting from the slope of the upper surface. For that reason the two types are grouped together as "pressure-controlled" types. In extrusion flow the differential pressures cause the more plastic basal ice of a glacier to be extruded from beneath the less plastic overlying ice. Where the flow is obstructed, whether by a topographic barrier or in the forward thinning end of a glacier, the movement is forward and surfaceward. The extruded ice overrides the obstruction.

Gravity flow can occur only where the glacier's floor has an appreciable slope. It is, therefore, called "drainage-controlled." The surface of the glacier is either parallel to the floor or slopes less steeply. Under such circumstances a glacier may be likened to a tilted pack of cards, in which each card (of infinitesimal thickness) slides differentially over the next below it. These differential movements increase with depth, yet the uppermost layer moves fastest as it is carried by the sum of all underlying movements. The stresses responsible for such movements are shear components of gravitative force. Where gravity flow is obstructed, there is, as with obstructed extrusion flow, a forward and surfaceward movement. If the surface slope is gentle, such movement will have an upward component, but if the surface slope is steep, the lines of movement will also slope downstreamward. Where the surface slope of a glacier is reduced downstreamward, a transition from obstructed gravity flow to obstructed extrusion flow occurs.

599TH MEETING

The 599th meeting of the Society was held at the Cosmos Club, November 26, 1941, President J. B. Reeside, Jr., presiding.

Program.—P. W. Guild: *Chromite deposits of the Kenai Peninsula, Alaska.*

Chester Stock: *Cretaceous reptiles from the Moreno formation, California.*

M. D. Foster: *Chemical composition of salty*

ground waters along the Atlantic and Gulf Coasts. Salty waters encountered in water-bearing sands along the Atlantic and Gulf coasts do not appear to be simple mixtures of groundwater with more or less sea water. When the salty waters are compared with theoretical mixtures of fresh ground waters and sea water —the ground waters being from comparable depths in the same formations and the amount of sea water being that indicated by the chloride contents of the salty waters—the natural salty waters are found to be characteristically lower in calcium, magnesium, and sulphate and higher in sodium content, suggesting that the waters have undergone base-exchange and reduction of sulphate.

The indicated replacement of magnesium and calcium in the salty waters by sodium from base-exchange minerals in the sands suggests that these base-exchange minerals are not in equilibrium with present day sea water or with salty waters formed by its admixture with fresh ground waters in which sodium bicarbonate is the predominant constituent. These relations further suggest that the water-bearing sands have at some time been flushed of salt water, at least to a point farther down the dip than at present by water having a lower Ca/Na and Mg/Na ratio and that the salt water now contaminating the fresh waters is a new advance inland of sea water and not connate waters.

The low sulphate content of the salty waters is attributed to reduction of sulphate, but whether the causative agent of the reduction was living organisms or inanimate organic matter or whether reduction took place at the time the sediments were deposited or subsequently cannot be proved definitely at the present time. The parent salt waters of these salty waters may have been connate waters in which sulphate had been reduced—as reduction is known to take place in environmental conditions like those under which some of the sediments in the Coastal Plain were laid down. In the flushing implied by the low calcium and magnesium content of the waters the connate waters may have been forced seaward but may not have been completely flushed from the beds and subsequent lowering of the fresh water head relative to the head of sea water may have permitted the connate water to move farther inland.

The fact that unselected salty waters from widely different sources, both geographically and geologically, in the Atlantic and Gulf Coastal Plain have apparently undergone similar alterations in mineral composition would seem to indicate that the conditions responsible for these alterations are rather general throughout the area.

600TH MEETING

The 600th meeting of the Society was held at the Cosmos Club, December 10, 1941, President J. B. REESIDE, JR., presiding.

Program.—Presidential Address: *Upper Cretaceous sediments of the Western Interior.*

49TH ANNUAL MEETING

The 49th Annual Meeting was held immediately following the 600th regular meeting. The reports of the secretaries, treasurer, and auditing committee were read and approved. Officers for the year 1942 were then elected, as follows:

President: C. S. ROSS.
Vice-Presidents: L. W. CURRIER, H. INSLEY.
Treasurer: K. J. MURATA.
Secretary: J. J. FAHEY.
Council: R. C. CADY, R. P. FISCHER, PHILIP S. GUILD, H. S. LADD, C. F. PARK, JR.

The Society nominated J. B. REESIDE, JR., to be a Vice-President of the Washington Academy of Sciences for the year 1942.

Obituaries

WALTER FORD REYNOLDS, principal mathematician and chief of the section of triangulation, Division of Geodesy, U. S. Coast and Geodetic Survey, Washington, D. C., died in his native city of Baltimore on Friday, May 1, 1942, after an illness of several months.

Born on May 25, 1880, the son of Robert Fuller and Catherine (Myers) Reynolds, his school career carried him through the grammar and high schools of Baltimore, and through Johns Hopkins University (A.B., 1902) where he remained for several years engaged in graduate work in mathematics and physics. Upon the completion of his studies, he served as an

instructor in mathematics in Baltimore City College (1905–6) and as a computer in the U. S. Naval Observatory (1907).

Entering the Coast and Geodetic Survey in 1907 as a computer, Mr. Reynolds devoted his talents to the study of geodetic surveys, particularly to the mathematical analysis and adjustment of triangulation and to the solution of intricate problems in geodetic surveying.

During the latter part of the first World War Mr. Reynolds served as acting chief of the Division of Geodesy, and from 1917 to 1924 was chief computer of that division. Since 1924, as chief of the section of triangulation, he gave his entire time to directing the work of a staff of mathematicians in the computation and adjustment of the national triangulation survey of the country. He also directed the computation of similar work executed in Alaska, Puerto Rico, and the Hawaiian Islands.

Mr. Reynolds was the author of a number of reports and technical manuals. The reports included survey results in a number of States: Alabama, Mississippi, Maine, Missouri, and Minnesota, and in Alaska. There were also two manuals of considerable importance: *Relation between plane rectangular coordinates and geographic positions* (1921) and *Manual of triangulation computation and adjustment* (1927). These have become standards with engineers engaged on surveying operations, and are used in some technical schools.

He held membership in the Mathematical Association of America, Philosophical Society of Washington, Washington Academy of Sciences, American Geophysical Union, National Geographic Society, American Congress on Surveying and Mapping, and Pi Gamma Mu.

On June 26, 1907, Mr. Reynolds was married to Ada C. Williams, who with three children, Catherine A. Mummert, Robert W. and Walter F. Jr., survives him.—CLEMENT L. GARNER.

EDWARD CENTER GROESBECK, a member of the Washington Academy of Sciences since 1932, died on May 9, 1942, in his sixty-first year. He was born at Albany, N. Y., on October 15, 1881, and since the early age of 3 years he was totally deaf. With the help of a devoted teacher, however, he perfected his speaking ability and also learned the art of lip reading, in which he acquired great skill in later life. His early education was essentially that of a normal boy, and in 1904 he was graduated from Williams College with the degree of B.A., and two years later from Massachusetts Institute of Technology with the degree of S.B. All this was accomplished by his own endeavors without the aid of special tutors. The honorary degree, A.M., was conferred by Williams College in 1909.

After graduation Mr. Groesbeck served for 3 years as research assistant to Prof. Henry Marion Howe, Columbia University, an association that was a deciding factor in his choice of a life career. After a year in the laboratory of the Taylor Wharton Steel Co., High Bridge, N. J., he was associated with the Pittsfield branch of the General Electric Co. (1910–15). Later (1915–18) he renewed his association with Professor Howe as research assistant, and in this capacity he was stationed at the National Bureau of Standards during the first World War where he was engaged on problems relating to ordnance steels. After the termination of this work in 1918, he was retained on the metallurgical staff of the Bureau, where he was progressively advanced up to the rank of metallurgist and served for 20 years until retirement for physical disability in 1938.

He made valuable contributions to knowledge in the field of microscopy of metals. In this work recompense for his handicap was attained in the ability to concentrate, which he developed to an extraordinary degree. This was also a decided advantage to him in the work of reviewing and evaluating data in the technical literature as a basis for a number of Bureau of Standards information circulars on metals and alloys which he compiled. It was in research on corrosion, however, in which he excelled and in which field he made numerous notable contributions. He was a member of the American Institute of Mining and Metallurgical Engineers, the American Society for Testing Materials, and the American Society for Metals.

In 1926, he married Miss Lee Robinson of Washington, D. C., who died in 1930. Pleasant, genial, always cheerful, with a keen interest in all the commonplace incidents of daily life, and possessed of a keen sense of humor, Mr. Groesbeck, was a favorite with his fellow workers. He asked only to be accepted on an equal footing with them without any special privileges because of his handicap.—HENRY S. RAWDON.